DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now to FIG. 1, there is shown a partial view of a mowing vehicle 10 generally adapted for mowing golf course fairways, and having an embodiment of the present invention coupled thereto. The vehicle 10 includes a plurality of ground engaging wheels 12 and a frame 14. A plurality of reel mower cutting units 16, 18, 20, 22 and 24 are coupled with the vehicle 10 for mowing grass. The cutting units 16–24 each include a generally cylindrical cutting reel 26, and ground engaging front and rear support means or rollers 28 and 30 which support respective cutting units 16, 18, 20, 22 or 24 at the proper cutting height above the ground during mowing operations.

A mechanism is provided for operatively coupling the cutting units 16–24 with the vehicle 10, and also for raising and lowering the cutting units 16–24. As best seen in FIGS. 1 and 2, a portion of the frame 14 extends between the vehicle's front ground engaging wheels 12. Inverted U-shaped straps 32 shown in FIG. 2 serve to couple bushings 34 with the frame 14. The bushings 34 each pivotally receive a forwardly extending arm means 36. Crank members 38, best seen in FIG. 1, are fixed to each arm 36, and are engaged by a hydraulic cylinder 40 which selectively pivots the arms 36 to raise and lower respective cutting units 16–24 carried at the end portion of each arm 36. The hydraulic cylinders 40 are also adapted to apply a downforce to the arms 36 for operatively pressing the cutting unit 16–24 against the ground during mowing operations.

As seen in FIGS. 1 and 2, a pivotal coupling mechanism or knuckle joint 42 is carried at the forward end portion of the arm 36. The coupling mechanism 42 allows for pivotal motion about a generally horizontal axis defined by the end portion of the arm 36. A horizontal shaft 44 is received within the end portion of the arm 36 for allowing pivotal motion about a horizontal axis. A double conical opening 46 is defined in the horizontal shaft 44. A pin 48 is positioned within both the double conical opening 46 and an opening formed in the end portion of the arm 36 for securing the horizontal shaft 44 in position. The double conical shape of the opening 46 allows limited pivotal movement of the horizontal shaft 44. The knuckle joint 42 includes an upright shaft 50 pivotal about a vertical axis. A double conical opening 52, as best seen in FIG. 5, and a pin 54 received therein allow the upright shaft 50 to pivot throughout a limited range of motion. A yoke 56 is releasably pinned to the knuckle joint 42. The yoke 56 and cutting unit 16 thereattached pivot with the shaft 44 about the horizontal axis, and also pivot with the upright shaft 50 about the vertical axis.

The yoke 56 includes a set of pins 58 and 68, as best seen in FIG. 2, which can be removed to allow the yoke 56 and cutting unit 16 to swing downwardly with respect to the knuckle joint 42 to a service mode, and also allow the yoke 56 to be detached from the knuckle joint 42. A first pin 58 is received during mowing operations by first openings 60 defined in a pair of laterally spaced plates 62 which are fixed as by welds to the front bar 64 of the yoke 56. Openings 66 defined beneath the body portion of the knuckle joint 42 receive the first pin 58 for preventing the yoke 56 from pivoting with respect to the knuckle joint 42. When the first pin 58 is removed, the yoke 56 and cutting unit 16 thereattached are allowed to pivot downwardly with respect to the knuckle joint 42 when the arm 36 is raised, thereby exposing the underside of the cutting units 16–20 forwardly for service. A second pin 68 confines the yoke's front bar 64 within a groove 70 defined in the front portion of the knuckle joint 42. The second pin 68 can be removed to allow the yoke 56 and cutting unit thereattached to be removed from the vehicle 10.

The laterally spaced plates 62 also define second openings 72. When the yoke 56 swings downward to its maintenance position while the arm 36 is in a raised position, the second openings 72 in the laterally spaced plates 62 can be aligned with the openings 66 in the knuckle joint 42 for insertion of the first pin 58. With the first pin 58 inserted in the second opening 72 and the knuckle joint's opening 66, the yoke 56 is rigidly held against pivotal motion such that an operator can make adjustments to the exposed underside of the cutting unit.

The yoke 56 extends rearwardly on either side of the cutting unit to be pivotally connected to the rear portion of each of the laterally spaced side frames 74 of the cutting unit. A releasable cord or flexible member 76 extends between a forward portion of the cutting unit and the yoke 56 for maintaining the cutting unit in a generally horizontal position when the arms 36 are raised. When the arm 36 is raised to a transport position, the cable or cord 76 maintains the cutting unit in a generally horizontal position such that when the arm 36 is again lowered for mowing operations the cutting unit will come in contact with and ride across the ground properly. Also, as the arm 36 is raised to a service position and the yoke 56 pivots downwardly, the cord 76 prevents the cutting unit from swinging downwardly with respect to the yoke 56. The bottom of the cutting unit is thereby exposed forwardly when the yoke 56 swings downwardly for service. The flexibility of the cord 76 allows the cutting unit to pivot with respect to the yoke 56 as undulations in ground contour are encountered during mowing operations.

Referring now to FIG. 2, the operation of the rearward attachment point of the yoke to the cutting unit will next be discussed. When the vehicle 10 travels forward during mowing operations, the rollers 28 and 30 encounter resistance as they roll across the ground. The rolling resistance force is applied to the cutting unit 16 at the axis of the rollers 28 and 30, and is directed rearwardly and horizontally during forward travel of the vehicle 10. Rolling resistance changes with the velocity of the vehicle 10 and ground conditions. The connection point 78 about which the cutting unit pivots with respect to the yoke 56 is located a distance above the axis of the front roller 28. Therefore, the rolling resistance force encountered at the front roller 28 acts to urge or force the front portion of the cutting unit 16 to pivot rearwardly and downwardly about the connection point 78 in a clockwise direction as viewed in FIG. 2. The rolling resistance encountered by the rear roller 30 acts to urge or force the rear portion of the cutting unit to pivot rearwardly and upwardly about the connection point 78, also in the clockwise direction as viewed in FIG. 2, thereby further causing the cutting unit's front portion to dip downwardly. Rolling resistance therefore acts to force the front portion of the cutting unit 16 downwardly against the ground such that it may dip down or dig into the ground.

However, the present invention acts to reduce the tendency of the front portion of the cutting unit to dip or dig downwardly. The downforce which is applied to

the cutting unit via the hydraulic cylinders 40 and the weight of the arms is transmitted through the connection point 78. The connection point 78 is located between the rollers 28 and 30 but closer to the rear roller 30 than the front roller 28, and is behind the cutting unit's center of gravity 80. The rearward location of the connection point 78 serves to distribute a greater portion of the downforce to the rear roller 30 than to the front roller 28. When the vehicle 10 is stationary, the force transmitted to the ground through the rollers 28 and 30 results from the weight of the cutting unit and the downforce applied through the connection point 78. Since the connection point 78 is closer to the rear roller 30 than the front roller 28, a greater portion of the downforce is transmitted to the ground through the rear roller 30 than through the front roller 28. Therefore, when stationary the cutting unit transmits more force to the ground through the rear roller 30 than through the front roller 28. However, when the mower is traveling forward, the rolling resistance acts to increase the amount of force applied to the ground through the front roller 28, since the rolling resistance urges the front portion of the cutting unit downwardly and the rear portion of the cutting unit upwardly. During operation of the present invention, the rolling resistance will act to increase the amount of force transmitted to the ground through the front roller 28 to an extent that the forces transmitted to the ground through the front and rear rollers 28 and 30 become generally equal or balanced. The tendency of the front portion of the cutting unit to dip or dig is therefore reduced, and cut quality is generally enhanced.

The pivotal connection point 78 can be positioned at a variety of different locations to yield generally equal or balanced force distribution at the rollers 28 and 30 during forward travel. For example, the connection point 78 shown in FIG. 2 could be positioned at a lower position than shown. The lower location would decrease the vertical distance between the connection point 78 and the axis of the front roller 28. This distance is the "lever arm" or moment arm at which rolling resistance is applied, resulting in the cutting unit being urged to pivot about the connection point. The smaller the lever arm, the smaller will be the moment which pivots the cutting unit about the connection point and presses the front portion of the cutting unit downwardly against the ground. Therefore, since the cutting unit has less tendency to dip due to the lower connection point, the connection point should be positioned farther forward, since a smaller portion of the downforce needs to be applied to the rear roller to achieve general balance between rollers. Lower connection points should therefore be positioned nearer the midpoint of the rollers 28 and 30, and higher connection point locations should be positioned nearer the rear roller 30.

Each connection point of the present invention is located at the upper rear quadrant of a respective side frame 74. The connection point 78 could be located at particular positions above the top edge of the side frame 74 and still serve to equalize the force transferred to the ground by the front and rear rollers 28 and 30. However, additional structure would have to be coupled with the side frame 74 to establish such an attachment location, thereby adding manufacturing expense to the mechanism. The upper rear quadrant of the side frame is a location which is not crowded with other components, such as cutting height adjustment mechanisms or hydraulic motors which are carried on the side of the side frames. Therefore, the upper rear quadrant provides a convenient location for coupling the yoke 56 to the side frame 74. The pivotal connection point 78 could be positioned laterally outwardly from structures such as the hydraulic motor, but additional framework or structure would have to be built onto the side frame 74 to establish such a connection point, thereby increasing the complexity and cost of the mechanism.

The particular cutting unit shown in FIG. 2, has front and rear rollers 28 and 30 spaced 282.5 mm apart. The front roller 28 has a 3 inch diameter, and the rear roller 30 has a 2 inch diameter. The cutting unit weighs approximately 90 pounds, of which about 48.9 pounds are distributed to the rear roller 30, and about 40.9 pounds are distributed to the front roller 28. The center of gravity 80 is located 52.3 mm above and 123.7 mm in front of the rear roller 30. The pivotal connection point 78 is located about 118 mm above and 48 mm in front of the rear roller 30. The downforce which the hydraulic cylinder 40 operatively applies to the cutting unit is about 30 pounds, and the downforce applied due to the weight of the arm is 13 pounds. The recommended vehicle speed during mowing operations is 5 miles per hour.

Different cutting units have different characteristics such as static weight distributions between the front and rear rollers, or different centers of gravity. Therefore, the pivotal connection points of cutting units having different characteristics may have to be positioned at different locations to achieve balanced force distribution at the rollers during forward travel. The yoke shown in FIG. 2 is provided with an auxiliary opening or coupling location 82 adapted for receiving a cutting unit having a different size, weight and center of gravity.

Rolling resistance will vary with the speed of the vehicle 10 and variations in ground conditions. Therefore, the particular force distribution between the front and rear rollers 28 and 30 will vary somewhat at different operating speeds and ground conditions.

The hydraulic cylinders 40 can be operated to raise the arms 36 to a transport position whereat the cutting units 16–24 are raised off the ground. As the arm 36 is raised, the cord 76 prevents the front portion of the cutting unit from pivoting downwardly with respect to the yoke 56. The cutting unit thereby remains in a relatively horizontal position such that it will smoothly and properly engage the ground once it is again lowered to resume mowing operations.

Next, the operation of the cutting units to their swing-out service position will be discussed. The cutting units 16–24 can be raised to a maintenance or service position whereat the underside of the cutting unit is exposed to facilitate adjustments such as reel to bedknife adjustments. In order to raise the cutting units 16–24 to the service position, an operator removes the first pin 58 and the pin 48 received by the horizontal shaft 44. The operator then raises the arm 36 via the hydraulic cylinder 40. As the arm 36 raises, the horizontal shaft 44 pivots within the end portion of the arm 36. Furthermore, due to the absence of the first pin 58, the weight of the cutting unit causes the yoke 56 and cutting unit to pivot downwardly and forwardly with respect to the arm 36. As the arm 36 continues to be raised, the cutting unit is eventually lifted off the ground. The cord 76 insures that the bottom of the cutting unit will be facing forwardly as the cutting unit is lifted. The second open-

ings 72 in the laterally spaced plates 62 can be aligned with the knuckle joint's opening 66, and the first pin 58 inserted for rigidly securing the yoke 56 in the service position shown in FIG. 3. The reel and bedknife which are positioned at the bottom or underside of the cutting unit during operation are now exposed forwardly for service and held firmly in place by the first pin 58.

To raise the rear cutting units 22 and 24 to a maintenance position whereat the undersides of the rear cutting units 22 and 24 are exposed for service the operator removes the pin 54 carried by the upright shaft 50, and removes the first pin 58. With the pin 54 removed from the upright shaft 52, the yoke 56 and rear cutting unit 22 or 24 can be pivoted about the upright shaft's pivot axis. The operator can then raise the arm 36 by controlling the hydraulic cylinder 40. With the first pin 58 removed, the yoke 56 and rear cutting unit 22 or 24 will pivot downwardly with respect to the knuckle joint 42 as the arm 36 is raised. An oversized washer 84 bolted to the top of the upright shaft 50 prevents the upright shaft 50 from sliding out of the body of the knuckle joint 42. Since the yoke 56 and rear cutting unit 22 or 24 have been pivoted about the axis of the upright shaft 52, the bedknife and reel carried on the underside of the rear cutting unit 22 or 24 are exposed outwardly from the vehicle 10 as the arm 36 is raised. An operator is thereby provided with improved access to the rear cutting units 22 and 24 for maintenance. The yoke 56 can be pivoted to align the second opening 72 of the plate 62 with the knuckle joint's opening 66, and the first pin 58 can be inserted for rigidly securing the yoke 56 and rear cutting unit 22 or 24 in the service position.

To lower the cutting unit 16–24 to its mowing position, the operator removes the first pin 58. The yoke 56 and cutting unit pivot slightly rearwardly from the position shown in FIG. 3 until the cutting unit's center of gravity 80 falls generally directly beneath the axis of the front bar 64 about which the yoke 56 and cutting unit are pivoting. As the operator lowers the arm 36 via the hydraulic cylinders 40, the rear roller 30 contacts the ground at a location rearwardly of the axis of the front bar 64, which is the point about which the yoke and cutting unit are pivoting. Therefore the cutting unit will pivot rearwardly when it contacts the ground. Once both rollers of the cutting unit are firmly on the ground again, the first pin 58 can be reinserted through the first opening 60 for rigidly securing the yoke 56 with the knuckle joint 42.

Referring now to FIGS. 4–7, there is shown a second embodiment 86 of the knuckle joint. A groove 70 and second pin 68 are provided for pivotally confining the front bar 64 of the yoke 56. A pair of first pins 88 are biased outwardly by a rod-like lever 90 which extends through each of the first pins 88. To shift the pins 88 inwardly, the lever 90 is pivoted downwardly. The end portions 92 of the lever 90 engage ramp means 94 formed in the knuckle joint 86. The end portions 92 of the lever 90 are pressed or shifted inwardly toward each other as the lever 90 pivots downwardly. The first pins 88 shift inwardly with the end portions 92 of the lever 90, and thereby become removed from the first openings 60 in the laterally spaced plates 62.

As the operator pivots the lever 90 downwardly, the end portions 92 of the lever 90 shift past the ramped portion 94 and onto a flatted portion 96 where the lever 90 will generally remain stationary. With the first pins 88 disengaged from the first openings 60 of the plates 62, the yoke 56 is allowed to pivot downwardly when the arm 36 and cutting unit are raised for service. When the cutting unit is lifted off the ground, the operator can pivot the lever 90 upwardly, thereby pressing or biasing the first pins 88 outwardly against the plates 62. The operator may need to manually pivot the yoke 56 forwardly slightly with respect to the plates 62 in order to align the first pins 88 with the second openings 72. The first pins 88 are biased outwardly and will spring outwardly into the second opening 72 when proper alignment is achieved. The biasing action of the lever 90 eliminates the need for the operator to manually reinsert the first pin at the same time he is pivoting the yoke 56 to the proper alignment. Manipulating the yoke 56 and cutting unit to its rigidly secured service position is therefore facilitated.

When the cutting unit is to be returned to its mowing configuration, the lever 90 is pivoted downwardly to disengage the first pins 88 from the second openings 72 in the plates. The cutting unit's center of gravity 80 pivots rearwardly to a position generally beneath the front bar 64. The rear roller 30 is therefore positioned behind the pivot point such that as the arm 36 is lowered via the hydraulic cylinder 40 the cutting unit will pivot rearwardly to its mowing position when the ground is contacted. Once lowered, the lever 90 is again shifted upwardly to bias the first pins 88 outwardly. The first pins 88 will engage the first openings 60 in the plates 62 once proper alignment is achieved.

Referring now to FIGS. 8–11, there is shown a second embodiment 100 of the swing out feature of the present invention. Mounted for being towed or carried by the vehicle are right, central and left front cutting units 16, 18 and 20 respectively, and right and left rear cutting units 22 and 24, respectively. Each cutting unit includes opposite side frames 74. Extending between and being rotatably mounted in the side frames 74 is a cutting reel 26. The correct height of cut is maintained by front and rear rollers 28 and 30, respectively, which have their opposite ends mounted to the side frames 74 by respective mounting assemblies which provide vertical adjustment. Associated with each cutting unit is a drag or trailing link structure in the form of a yoke 102 having opposite ends pivotally connected, as by pins 104, to the side frames 74 whereby a horizontal pivot axis or connection point is established between the yoke 102 and the cutting unit. Forming a portion of the yoke 102 and being located centrally between the opposite ends thereof is a cylindrical tubular receptacle 106 which is used for mounting the yoke 102 to lift arms 36 of the vehicle 10 in a manner described in more detail below.

As viewed in FIGS. 10 and 11, each of the arms 36 include an elongate intermediate section 108 constructed of tubular stock having a square cross-section and being bent so as to be substantially L-shaped, with its long leg extending outwardly at about a 65° angle to the direction of travel and with its short leg extending in the direction of travel. Forming inner and outer ends of each of the arms 36 are cylindrical tubular receptacles 110, 111 respectively. The receptacles 110 are horizontally disposed with the receptacle of the right front arm 36 being pivotally received on a horizontal, fore-and-aft extending right front pivot pin 112 located on the mower frame 14 inwardly of the right wheel 12 to thereby establish a pivotal connection with the frame 14 about which the arm 36 is vertically swingable. Similarly, the receptacle 110 of the central front arm 36 is pivotally received on a horizontal, fore-and-aft extend-

ing central front pivot pin **114** located on the mower frame **14** inwardly of the left front wheel **12** a distance slightly greater than the right front pivot pin **112** is from the right front wheel and at an elevation slightly below that of the pivot pin **112**. The receptacle **110** of the right rear arm **36** is pivotally received on a horizontal, fore-and-aft extending right rear pivot pin **116** mounted to a cross member **118** of the frame **14** disposed just forwardly of the rear wheels **12** at a location just to the right of the fore-and-aft centerline of the main frame **14**.

Similarly, the left front arm **36** and the left rear arm **36** are each constructed of an elongate tubular member of square cross section bent into an L-shape with the longer leg extending outwardly at an angle of about 65° with respect to the direction of travel and with the shorter leg extending in the direction of travel. A cylindrical tube forms a receptacle **120** at the inner end of each of the arms **36** with the receptacle **120** of the arm **36** being received on a horizontal, fore-and-aft extending left front pivot pin **122** mounted to the frame **14** at a location inwardly of the left front wheel **12** which mirrors the location of the right front pivot pin **112** and with the receptacle **120** of the arm **36** being pivotally received on a horizontal, fore-and-aft extending left rear pivot pin **124** mounted to the cross frame structure **118** at a location just to the left of the centerline of the frame **14** so as to be in side-by-side relationship to the pivot pin **116**. Cylindrical tubes form receptacles **126** which are each oriented upwardly and inclined slightly inwardly.

The arms **36** are respectively coupled to the cutting units **16–24** by identical coupling structures **128**. Each coupling structure **128** includes a v-shaped coupling pin **130** having a first limb pivotally received in a respective one of the outer receptacles **111, 126** and has a second limb pivotally received in the receptacle **106** of the yoke **102** of a respective one of the cutting units **16–24**. Keys or pins (not shown) are received in holes provided in opposite ends of the coupling pin **130** so as to maintain the respective connections between the arms **36** and the yokes of the cutting units **16–24**. A v-shaped plate **132** has a first leg received on the coupling pin **130** at a location beneath the associated receptacle **111, 126** and has a second leg received on the coupling pin at a location in front of the respective yoke receptacle **106**. A v-shaped notch **134** is formed in the front end of the first leg of the plate **132** and a stop or limit pin **136** extending downwardly through a receptacle **138**, provided on the forward side of the yoke receptacle **111**, and into the v-shaped notch serves to limit the amount that the respective cutting unit **16–24** and coupling pin is permitted to swivel during turning of the reel mower **10** so as to ensure that the cutting unit tracks properly relative to the other units so as not to leave a strip of uncut grass. The pin **136** may be withdrawn from the receptacle **138** so as to permit the unit to be turned to a more favorable attitude for servicing in a manner described in more detail below. Respectively connected between a hook **140** formed at the bend of each of the arms **36** and a pin **142** welded to a central location of an upper cross member of the frames of each of the cutting units **16–24** is a flexible lift member **144** here shown as a cable having clevises at opposite ends thereof. The lift member **144** acts to keep the cutting units substantially level when they are raised from their lowered working positions to transport positions, for example. It is noted that a chain may be substituted for each of the lift cables if desired.

A power lift means is provided for raising and lowering the cutting units **16–24** from and to their working positions shown in FIG. **9**. Specifically, the power lift means includes a first, extensible and retractable hydraulic cylinder **146** having its head end pinned to a pair of upstanding cranks **148** provided on the rear portion of the inner receptacle **110** of the right front arm **36**. The rod end of the cylinder **146** is coupled to a rod extension **150** having its free end pinned to a pair of upstanding cranks **152** provided on the rear portion of the inner receptacle **120** of the left front arm **36**. Thus, it will be appreciated that retraction of the cylinder **146** will result in the right and left front arms **36** being rotated about the pivot pins **112** and **122** so as to exert a lifting force on the trailed cutting units **16** and **20** by way of the yokes **102** and the flexible lift members **144**. The central front cutting unit **18** is similarly lifted through means of an extensible and retractable hydraulic cylinder **154** having its head end pinned to the frame **14**, as at **156**, and having its rod end pinned to a pair of cranks **158** depending from the rear portion of the inner receptacle **110** of the central front arm **36**. Retraction of the cylinder **154** will result in the lift arm **36** being swung vertically about the pivot pin **114** so as to exert a lifting force on the yoke of the trailed cutting unit **18** and on the lift member **144**.

The rear cutting units **22** and **24** are raised and lowered through operation of a rear extensible and retractable hydraulic cylinder **160** having its rod end pinned to a pair of upstanding cranks **162** provided on the right receptacle **110** and having its head end pinned to a pair of upstanding cranks **164** provided on the left rear arm **36**. Thus, it will be seen that retraction of the cylinder **160** will result in the right and left rear arms **36** being swung upwardly about the pivot pins **116** and **124** so as to exert a lifting force on the right and left rear cutting units **22** and **24** by way of the respective yokes **102** and lift members **144**.

The lifting means for the cutting units **16–24** is used for placing the units in a desired attitude for servicing. For example, assuming the cutting units to be in their lowered working positions, as shown in FIG. **8**, the right front cutting unit **16** may be placed in an attitude for checking its height of cut and/or the clearance between the bed knife and reel **26** by first disconnecting the lift member **144** from the cutting unit frame and removing the grass catcher and bail. The hydraulic cylinder **146** is then actuated to cause it to extend and raise the lift arm **36** resulting in the yoke being elevated to the extent that the cutting unit **16** is suspended in the air with the rear roller **30** being raised above the ground, as shown in FIG. **9**. The front roller **28**, rear roller **30**, reel **26** and bed knife are then clearly visible to a technician positioned at the front of the machine so that the height of cut and bed knife clearance may be checked by any well known method.

Assuming that it is also desired to check the height of cut and/or the bed knife clearance of the right rear cutting unit **22**, the same procedure of disconnecting the lift member **144** and of removing the grass catcher from the cutting unit is followed. In addition, the stop or limit pin **136** is removed from its receptacle **138**. The hydraulic cylinder **160** is then retracted to effect vertical swinging of the right rear lift arm **36** and hence, the lifting of the cutting unit **22** above the ground. The cutting unit **22** is then grasped and rotated 90° clockwise, together with the coupling pin **130** about the axis of that limb of the pin which is located in the outer receptacle **111** of the arm **36**. The front roller **28**, rear roller **30**, reel **26** and bed knife are then disposed out-

wardly, as shown in FIG. 9, so as to be in full view of a technician standing at the right side of the mower 10.

Thus, it will be appreciated that the suspension of the cutting units 16–24 from the main frame 14 of the mower 10 permits them to be easily accessed for servicing and in particular for the checking and adjustment if necessary of the height of cut or of the bed knife to reel clearance.

I claim:

1. A mower, comprising:

a reel mower cutting unit having front and rear portions, and a center of gravity, and front and rear support means for supporting the cutting unit on the ground during mowing operation,

an arm pivotally coupled with the cutting unit at a pivotal connection point,

said pivotal connection point being located to the rear of the cutting unit's center of gravity and above the front and rear support means for generally equalizing the force transmitted to the ground by the front and rear support means during forward travel.

2. The invention of claim 1, and further comprising a downforce applying means operatively coupled with the arm for applying a downward force to the cutting unit during operation.

3. The invention of claim 2, wherein the location of the pivotal connection point above the front and rear support means causes the front portion of the cutting unit to press downwardly against the ground due to ground resistance during forward travel, and the location of the pivotal connection point through which the downward force is applied to the cutting unit is behind the cutting unit's center of gravity for applying a greater portion of the downforce to the rear support means than the front support means for generally equalizing the amount of force applied to the ground by the front and rear support means during forward travel and thereby generally counteracting the tendency of the front portion to dip.

4. The invention of claim 3, wherein the front and rear supports are each transversely extending rollers.

5. The invention of claim 4, and further including a side frame positioned at a lateral edge portion of the cutting unit, said pivotal connection point being coupled directly to the side frame.

6. The invention of claim 1, wherein the pivotal connection point is located at an upper rear quadrant of the side frame.

7. A reel mower suspension mechanism for use with a vehicle, comprising:

a reel mower cutting unit having front and rear portions, said cutting unit including:

at least one side frame,

a ground engaging front roller coupled with the front portion of the cutting unit for generally supporting the front portion of the cutting unit during mowing operation,

a ground engaging rear roller coupled with the rear portion of the cutting unit for generally supporting the rear portion of the cutting unit during mowing operation, and

an arm coupled with the vehicle and operatively coupled with the side frame of the cutting unit at a pivotal connection point, said pivotal connection point being located to the rear of the cutting unit's center of gravity and above the front and rear rollers for generally equalizing the force transmitted to the ground by the front and rear support means during forward travel of the vehicle and cutting unit, thereby reducing the tendency of the front portion of the cutting unit to dip during forward travel.

8. The invention of claim 7, wherein the pivotal connection point is coupled with an upper rear quadrant of the side frame.

9. The invention of claim 7, wherein the pivotal connection point is located beneath a top edge of the side frame.

10. The invention of claim 7, wherein

the cutting unit further includes a pair of side frames laterally spaced from each other,

a yoke is pivotally coupled with each side frame of the cutting unit, and respective pivotal connection points couple each side frame with the yoke, and

said arm is coupled between the vehicle and the yoke for propelling the cutting unit with the vehicle.

11. The invention of claim 10, wherein the yoke is pulled by the arm during forward vehicle travel.

12. The invention of claim 7, and further comprising a downforce applying means operatively coupled with the arm for applying a downward force to the cutting unit during operation.

13. A reel mower suspension mechanism for use with a vehicle, comprising:

a reel mower cutting unit having front and rear portions, said cutting unit including:

a pair of laterally spaced side frames,

a ground engaging front roller coupled with the front portion of the cutting unit for generally supporting the front portion of the cutting unit during mowing operation,

a ground engaging rear roller coupled with the rear portion of the cutting unit for generally supporting the rear portion of the cutting unit during mowing operation, and

an arm means coupled with the vehicle,

a yoke means operatively connected between each side frame and the arm means for operatively coupling the cutting unit with the vehicle, a downward force being applied to the cutting unit via said yoke and arm means, and said yoke being pivotally coupled with the cutting unit at a location closer to the rear roller than the front roller for transmitting a greater portion of the downward force to the rear roller than the front roller and generally equalizing the weight carried by the front and rear rollers during forward travel for reducing the tendency of the front portion of the cutting unit to dip during forward travel.

14. The invention of claim 13, wherein the yoke means is coupled directly to an upper rear quadrant of each side frame.

15. A mower mechanism couplable to a vehicle, comprising:

an arm means pivotally coupled with the vehicle,

a reel mower cutting unit having an underside which must be accessed for service, said cutting unit being operatively coupled with the arm means for being propelled with the vehicle, said arm means being pivotal to raise the reel mower off the ground to a service position,

a yoke coupled between the cutting unit and the arm means, said cutting unit being generally pivotal with respect to the yoke,

a member coupled with the cutting unit for maintaining the cutting unit in generally horizontal position when the arm means is raised to a transport position, and

first releasable locking means for generally securing the yoke against excessive pivoting with respect to the arm means during mowing operations, said first locking means being releasable to allow the yoke to pivot downwardly with respect to the arm means when the arm means is raised to a service position for exposing the underside of the cutting unit for service.

16. The invention of claim 15, and further including a second releasable locking means which restricts excessive pivoting of the yoke about a generally vertical axis with respect to the arm means during mowing operation, said second locking means being releasable for allowing the yoke to pivot to expose the underside of the cutting unit laterally outwardly from the vehicle when the arm means is raised to its service position.

17. The invention of claim 15, wherein the yoke is coupled to the rear of the center of gravity of the cutting unit.

18. The invention of claim 17, wherein the member prevents the cutting unit from pivoting downwardly with respect to the yoke when the arm is raised to the service position.

19. The invention of claim 17, and further comprising front and rear ground engaging rollers, said yoke being coupled to the cutting unit at a location closer to the rear ground engaging roller than the front ground engaging roller.

20. The invention of claim 19, wherein the member extends between the cutting unit and yoke for preventing the cutting unit from pivoting dowardly with respect to the yoke when the arm is raised to the service position.

21. The invention of claim 19, wherein the member extends between the cutting unit and yoke for preventing the cutting unit from pivoting downwardly with respect to the yoke when the arm is raised to the service position.

22. A mower mechanism couplable to a vehicle, comprising:

an arm means pivotally coupled with the vehicle,

a reel mower cutting unit having an underside which must be accessed for service, said cutting unit being operatively coupled with the arm means for being propelled with the vehicle, said arm means being pivotal to raise the reel mower off the ground to a service position,

a yoke coupled between the cutting unit and the arm means, said yoke being coupled to the rear of the center of gravity of the cutting unit, and said cutting unit being generally pivotal with respect to the yoke,

a member coupled with the cutting unit for maintaining the cutting unit in generally horizontal position when the arm means is raised to a transport position, wherein the member generally prevents the cutting unit from pivoting downwardly with respect to the yoke when the arm is raised to a service position,

first releasable locking means for generally securing the yoke against excessive pivoting with respect to the arm means during mowing operations, said first locking means being releasable to allow the yoke to pivot downwardly with respect to the arm means when the arm means is raised to a service position for exposing the underside of the cutting unit for service.

23. The invention of claim 22, and further including a second releasable locking means which restricts excessive pivoting of the yoke about a generally vertical axis with respect to the arm means during mowing operation, said second locking means being releasable for allowing the yoke to pivot to expose the underside of the cutting unit laterally outwardly from the vehicle when the arm means is raised to its service position.

24. The invention of claim 23, and further comprising front and rear ground engaging rollers, said yoke being coupled to the cutting unit at a location closer to the rear ground engaging roller than the front ground engaging roller.

25. A mower mechanism couplable to a vehicle, comprising:

an arm means pivotally coupled with the vehicle,

a reel mower cutting unit having an underside which must be accessed for service, said cutting unit being operatively coupled with the arm means for being propelled with the vehicle, said arm means being pivotal to raise the reel mower off the ground to a transport position and a service position, and

a releasable member coupled with the cutting unit for maintaining the cutting unit in generally horizontal position when the arm means is raised to the transport position, said member being releasable to allow the cutting unit to swing downwardly with respect to the arm means to expose the underside of the cutting unit for service when said arm means is raised to the service position.

26. A reel mower including a main frame, an arm means vertically pivotally mounted to the main frame and a trailing link coupled to an end of the arm means, and a cutting unit having a frame supporting a reel and bed knife between front and rear rollers having a connection with the trailing link permitting vertical pivotal movement of the cutting unit about a horizontal axis extending cross wise to the direction of travel of the cutting unit, the improvement comprising: the connection of the arm member with the cutting unit being located at a first location on the cutting unit; and a lift element releasably connected between the lift arm and the cutting unit at a second location spaced from said first location so that the lift element maintains the cutting unit in a generally level attitude when lifted by raising the lift arm while the lift element is installed but permits the cutting unit to pivot at said connection to assume a position exposing said reel, bed knife and front and rear rollers when said lift element is released.

27. The reel mower defined in claim 26, wherein said connection includes a first pivot means for establishing a generally horizontal, fore-and-aft extending axis about which said trailing link and cutting unit may pivot.

28. The reel mower defined in claim 26 wherein said trailing link is in the form of a yoke having opposite ends pivotally attached to the cutting unit frame and having a central location between the opposite ends coupled to said lift arm.

29. The reel mower defined in claim 28 wherein said central location of the yoke is defined by a cylindrical tubular receptacle which extends in the direction of travel; and said connection including a coupling pin received in said receptacle whereby the yoke and cutting unit may pivot about said coupling pin.

30. A reel mower including a main frame, an arm means vertically pivotally mounted to the main frame and a trailing link coupled to an end of the lift arm, and a cutting unit having a frame supporting a reel and bed knife between front and rear rollers having a connection with the trailing link permitting vertical pivotal movement of the cutting unit about a horizontal axis extending cross wise to the direction of travel of the cutting unit, the improvement comprising: the connection with the cutting unit being located at a forward location of the cutting unit; and a lift element releasably connected between the lift arm and the cutting unit at a second location spaced rearwardly of said forward location so that the lift element maintains the cutting unit in a generally level attitude when lifted by raising the lift arm while the lift element is installed but permits the cutting unit to pivot at said connection to assume a position exposing said reel, bed knife and front and rear rollers when said lift element is released.

31. The reel mower as defined in claim 30 wherein the lift arm is located such that the cutting unit has a least a portion extending beneath said main frame when the cutting unit is in a lowered working position and such that said arm end is positioned outwardly of said main frame; and said connection defining a substantially upright axis about which the cutting unit may be pivoted to a position disposing the entire cutting unit frame outwardly of the main mower frame, whereby removal of the lifting element and lifting of the cutting unit through means of the arm and link will result in the bottom of the cutting unit being exposed for permitting a technician to check the height of cut and bed knife to reel clearance.

32. A mower mechanism couplable to a vehicle, comprising:

an arm means pivotally coupled with the vehicle,

a reel mower cutting unit having an underside which must be accessed for service, said cutting unit being operatively coupled with the arm means for being propelled with the vehicle, said arm means for being pivotal to raise the reel mower off the ground to a transport position and a service position, and

a releasable member coupled with the cutting unit for maintaining the cutting unit in generally horizontal position when the arm means is raised to the transport position, said member being releasable to allow the cutting unit to swing downwardly with respect to the arm means to expose the underside of the cutting unit for service when said arm means is raised to the service position,

a yoke which couples the cutting unit with the arm means, said cutting unit being generally pivotal with respect to the yoke, and

a releasable locking means which restricts the yoke from pivoting about a vertical axis during mowing operation, said locking means being releasable for allowing the yoke to pivot to expose the underside of the cutting unit laterally outwardly from the vehicle for service.

33. A reel mower including a main frame, an arm means vertically pivotally mounted to the main frame and a trailing link coupled to an end of the arm means, and a cutting unit having a frame supporting a reel and bed knife between front and rear rollers having a connection with the trailing link permitting vertical pivotal movement of the cutting unit about a horizontal axis extending cross wise to the direction of travel of the cutting unit, the improvement comprising: the connection of the arm member with the cutting unit being located at a first location on the cutting unit; and a lift element being releasably connected between the lift arm and the cutting unit at a second location spaced from said first location so that the lift element maintains the cutting unit in a generally level attitude when lifted by raising the lift arm while the lift element is installed but permits the cutting unit to pivot at said connection to assume a position exposing said reel, bed knife and front and rear rollers when said lift element is released,

wherein said connection includes a first pivot means for establishing a generally horizontal, fore-and-aft extending axis about which said trailing link and cutting unit may pivot, and

said connection includes a second pivot means for establishing a generally upright pivot axis about which said trailing link and cutting unit may pivot.

34. A reel mower including a main frame, an arm means vertically pivotally mounted to the main frame and a trailing link coupled to an end of the arm means, and a cutting unit having a frame supporting a reel and bed knife between front and rear rollers having a connection with the trailing link permitting vertical pivotal movement of the cutting unit about a horizontal axis extending cross wise to the direction of travel of the cutting unit, the improvement comprising: the connection of the arm member with the cutting unit being located at a first location on the cutting unit; and a lift element being releasably connected between the lift arm and the cutting unit at a second location spaced from said first location so that the lift element maintains the cutting unit in a generally level attitude when lifted by raising the lift arm while the lift element is installed but permits the cutting unit to pivot at said connection to assume a position exposing said reel, bed knife and front and rear rollers when said lift element is released,

wherein said trailing link is in the form of a yoke having opposite ends pivotally attached to the cutting unit frame and having a central location between the opposite ends coupled to said lift arm,

wherein said central location of the yoke is defined by a cylindrical tubular receptacle which extends in the direction of travel; and said connection including a coupling pin received in said receptacle whereby the yoke and cutting unit may pivot about said coupling pin, and

wherein said end of the arm is defined by a substantially upright tubular receptacle, and said connection including a v-shaped coupling pin having respective limbs received in said receptacles of the yoke and arm.

35. A reel mower including a main frame, an arm means vertically pivotally mounted to the main frame and a trailing link coupled to an end of the arm means, and a cutting unit having a frame supporting a reel and bed knife between front and rear rollers having a connection with the trailing link permitting vertical pivotal movement of the cutting unit about a horizontal axis extending cross wise to the direction of travel of the cutting unit, the improvement comprising: the connection of the arm member with the cutting unit being located at a first location on the cutting unit; and a lift element being releasably connected between the lift arm and the cutting unit at a second location spaced from said first location so that the lift element maintains the cutting unit in a generally level attitude when lifted by raising the lift arm while the lift element is installed but permits the cutting unit to pivot at said connection to

assume a position exposing said reel, bed knife and front and rear rollers when said lift element is released,

wherein said trailing link is in the form of a yoke having opposite ends pivotally attached to the cutting unit frame and having a central location between the opposite ends coupled to said lift arm,

wherein said central location of the yoke is defined by a cylindrical tubular receptacle which extends in the direction of travel; and said connection including a coupling pin received in said receptacle whereby the yoke and cutting unit may pivot about said coupling pin,

wherein said end of the arm is defined by a substantially upright tubular receptacle, and said connection including a v-shaped coupling pin having respective limbs received in said receptacles of the yoke and arm, and

wherein said connection further includes a v-shaped strap having respective limbs received on the respective limbs of the v-shaped coupling pin such that one strap limb is located ahead of the yoke receptacle while the other strap limb is located below the arm receptacle; said other strap limb being provided with a turn limiting notch; and a stop pin being releasably mounted to the arm receptacle with a lower end portion of the stop pin being located within the notch, whereby engagement of the stop pin with said other strap limb will limit the relative pivotal movement of the cutting unit to the arm as determined by the shape of the notch.

* * * * *

US005355665A

United States Patent [19]

Peter

[11] Patent Number: 5,355,665

[45] Date of Patent: Oct. 18, 1994

[54] FULL FLOTATION MOWER DECK

[75] Inventor: Tim Peter, Medina, Ohio

[73] Assignee: MTD Products Inc.

[21] Appl. No.: 46,647

[22] Filed: Apr. 13, 1993

[51] Int. Cl.[5] A01D 34/74

[52] U.S. Cl. 56/15.8; 56/17.1; 56/DIG. 22

[58] Field of Search ..... 56/6, 15.8, 16.7, 17.1, 56/17.2, 17.5, DIG. 22, DIG. 10

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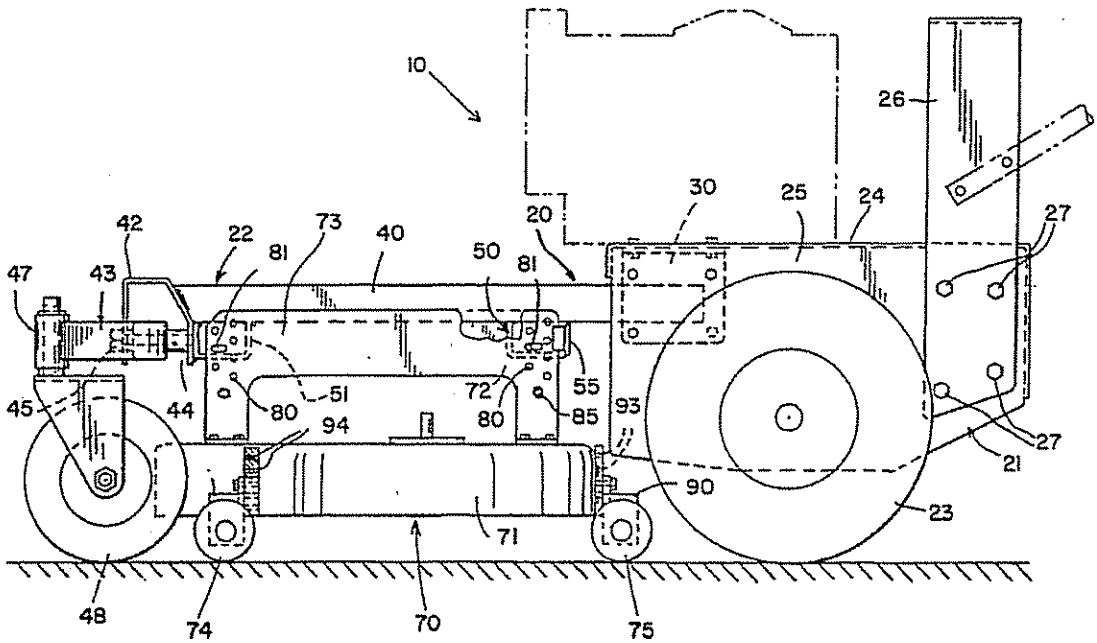
Primary Examiner—David J. Bagnell
Attorney, Agent, or Firm—Lightbody & Lucas

[57] ABSTRACT

A full flotation mower deck for a rear engine walk behind lawn mower, such flotation deck including a fixed frame having a pivoting axle, with the mower deck independently supported by anti-scalping wheels and interconnected to the frame by pins with a separate mechanical interconnection between the mower deck and the frame for forward and aft movement in respect thereto.

10 Claims, 3 Drawing Sheets



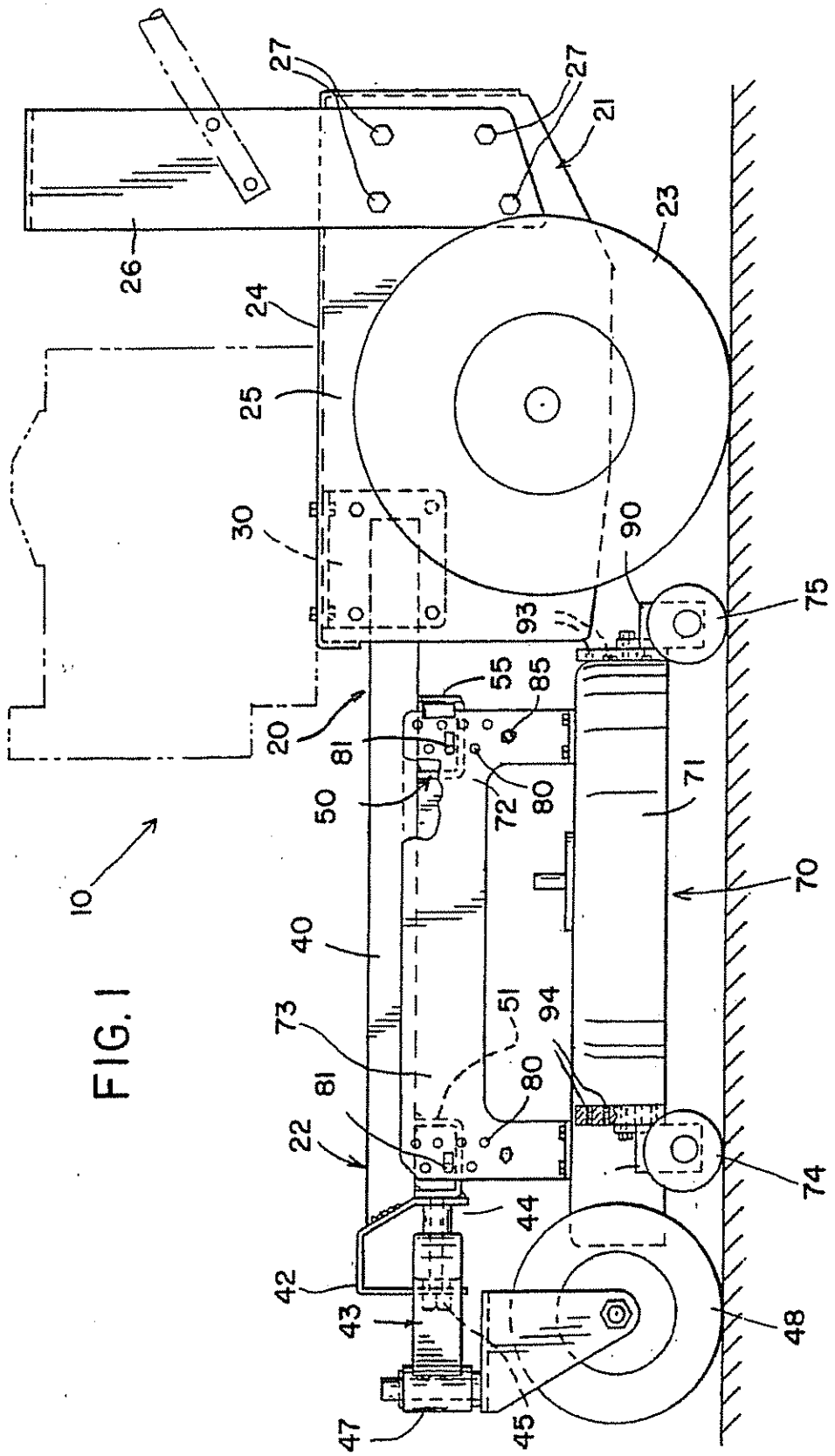

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FIG. 1

FIG. 2

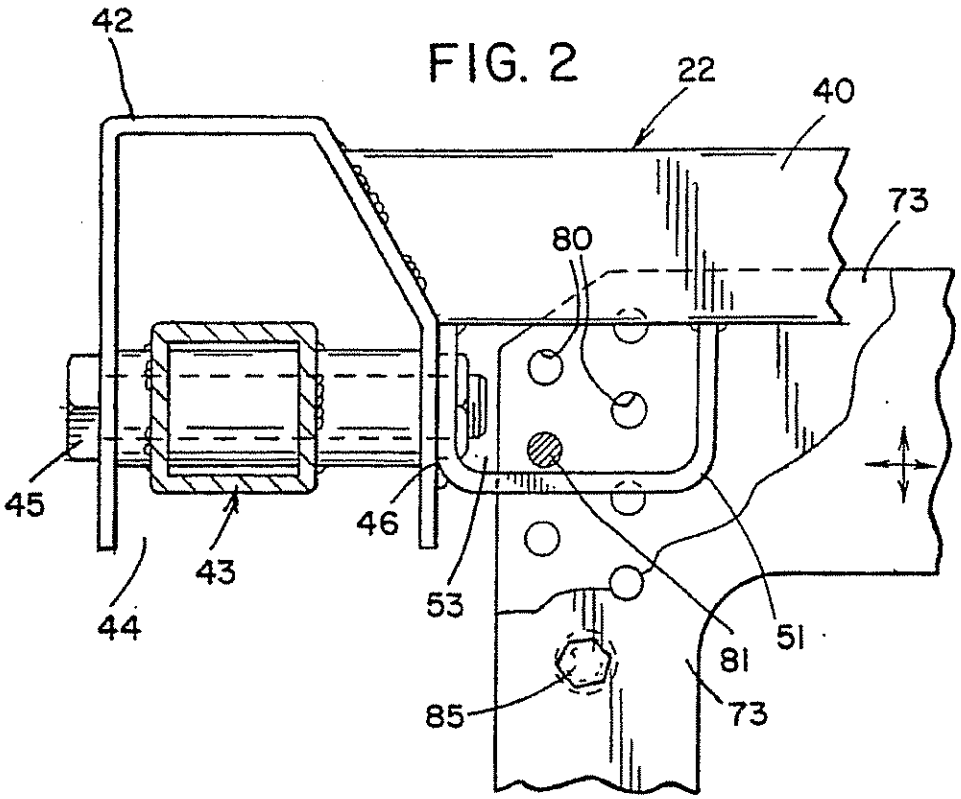
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FIG. 3

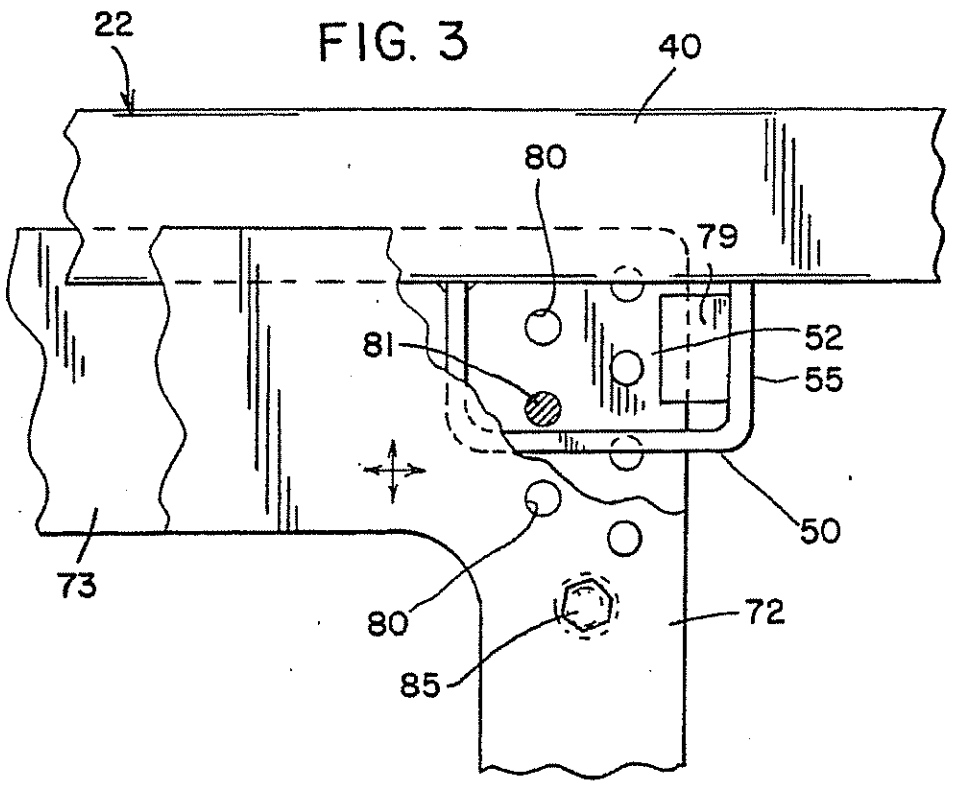
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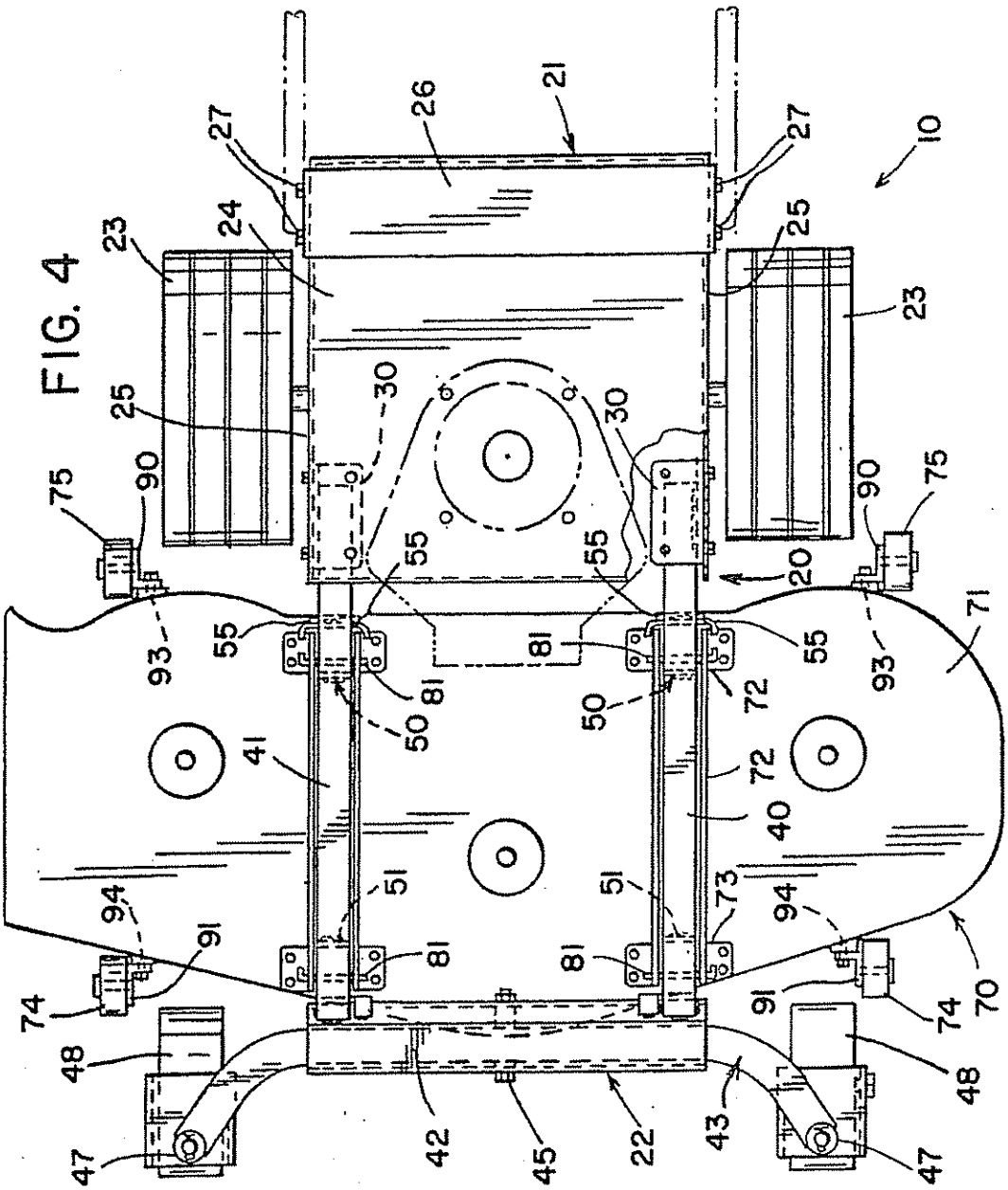
FIG. 4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FULL FLOTATION MOWER DECK

FIELD OF THE INVENTION

This invention relates to the mounting of a mower deck to a lawn and garden mower and, more particularly, to forward deck walk behind lawn mowers.

BACKGROUND OF THE INVENTION

Lawn and garden mowers typically have rotary blade mowing decks for usage therewith. Typically these decks are either fixedly connected to the frame between forward wheels and aft drive wheels or have some sort of semi-floating interconnection between a fixed frame and the cutting unit. Examples of these include U.S. Pat. Nos. 3,154,903, 3,375,645, and 4,325,211. Typically in these units, the mower deck has some sort of lost motion interconnection between the mower deck and a wheeled frame, which loss motion interconnection allows for the independent movement of the mower deck in respect to the units frame.

OBJECTS AND SUMMARY OF THE INVENTION

It is an object of the present invention to provide for a full flotation mower deck.

It is another object of the present invention to simplify the construction of a lawn mower including a mower deck.

It is yet another object of the present invention to allow for the independent movement of a mower deck in respect to all of the lawn mower wheels.

It is still another object of the present invention to strengthen the construction of lawn mowers including mower deck.

It is a further object of this invention to increase the longevity of lawn mowers including mower decks.

It is a still a further object of this invention to reduce the weight of lawn mowers including mower decks.

Other objects and a more complete understanding of the invention may be had by referring to the drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

The structure, operation, and advantages of the presently preferred embodiment of the invention will become further apparent upon consideration of the following description taken in conjunction with the accompanying drawings, wherein:

FIG. 1 is a side view of a mid mount walk behind lawn mower incorporating the invention of the application;

FIGS. 2 and 3 are enlarged partial side views of the mounting brackets of the lawn mower of FIG. 1; and,

FIG. 4 is a downward view of the frame and mower deck of the mid mount mower of FIG. 1.

DETAILED DESCRIPTION OF THE INVENTION

The mower deck of this invention is designed for use with a lawn mower **10**. The lawn mower **10** includes a frame **20** and a mower deck **70**.

The frame **20** of the vehicle **10** includes an aft section **21** and a forward section **22**. The aft section **21** serves for mounting the handlebars, engine, transmission, and the various clutches needed to operate the lawn mower. For clarity of presentation, these items are shown in phantom form in the figures in that they do not form a direct part of the invention. Two back drive wheels **23** extend off of either side of the aft section **21**. These two wheels **23** are selectively interconnected through clutches and variable speed mechanisms to the engine in one of a variety of manners well known in the art. The direction speed of rotation and braking condition of the wheels **23** is under the control of the operator. The aft section **21** itself is a generally rectangular unit having a flat top **24** with sides **25** downwardly extending therefrom. The sides **25** are fixedly connected to each other and to the flat top **24** so as to provide for a solid rectangular box member as the aft section **21**. In the embodiment shown, this aft section **21** is of $\frac{1}{8}$" plate steel formed and then welded together having 24×24×10" total dimensions. A large "U" shaped member **26** is fixedly connected to the aft section **21** so as to form a mounting location for the handlebars, fuel tank, and other secondary components of the lawn mower **10**. Again, in the preferred embodiment, this is a $\frac{1}{4}$" thick steel section, 5" wide raised 8" from the top **24**, fixedly connected to the sides **25** of the aft section **21** by eight bolts **27**. Due to the fact that the bottom of the aft section **21** is open, installation and maintenance of the secondary components such as clutches, transmissions, belts, and other secondary components is facilitated. Two generally "L" shaped reinforcing flanges **30** are fixedly connected to the aft section **21** near the forward end thereof. These reinforcing flanges **30** add additional strength against flexing at the interconnection between the aft section **21** and the forward section **22**. The particular reinforcing flanges **30** disclosed are made of $\frac{1}{4}$" steel 6" wide and 5+$\frac{1}{4}$" deep which are bolted to the top **24** and the sides **25** of the aft section **21**.

The forward section **22** is fixedly connected to the aft section **21** so as to complete the frame **20** of the lawn mower **10**. The forward section **22** itself is made up of two rails **40, 41**, a leading member **42**, and a swing axle **43**. The rails **40, 41** are fixedly welded to the leading member **42** at one end and fixedly welded to the reinforcing flange **30** which is fixedly bolted to the sides **25** of the aft section **21** at the back end. The rails **40, 41** thus serve to fixedly tie the forward section **22** to the aft section **21** to form the fixed, generally open center, rectangular shaped frame **20**.

The rails **40, 41** in the embodiment shown are 2" square tubing some 22" in total length. The leading member **42** is an inverted modified "U" shaped member having 3/16" thick walls, some 2' in length and 4" deep. The bottom portion **44** of the leading member **42** is open.

The swing axle **43** is physically located in this open bottom section **44** of the leading member **42** with a pivot bolt **45** interconnecting the two. The pivot bolt **45** interconnection allows the axle **43** to pivot substantially 7° in either direction of a central neutral position in respect to the leading member **42**. This reduces the stresses on the frame **20** in contrast to units wherein the axle is fixedly connected to the frame. The swing axle **43** in the embodiment shown is 2" square tubing some 35" in length. The ends **47** of the swing axle **43** are bent forward so as to provide clearance between the later described wheels **48** and the mower deck **70**. This shortens the length of the frame **20** by allowing the forward section **22** to be located more rearwardly than otherwise.

Two pivoting wheels **48** mounted to opposing ends **47** of the axle **43** complete the frame **20** of the lawn mower **10**. The location of the axle of the wheels **48** behind the pivot connection to the ends **47** of the axle

allow the wheels 48 to track, that is automatically adjust for the direction in which the lawn mower 10 is headed. This further reduces the strain on the frame 20.

Two generally "U" shaped sideward opening brackets 50, 51 extend downwardly off of the rails 40, 41, respectively, intermediate to the ends thereto. These generally "U" shaped brackets 50, 51 are fixed to the rails 40, 41 in the preferred embodiment by welding the upper ends of the "U" to the bottom surface of the rails 40, 41. This fixedly interconnects the "U" shaped brackets 50, 51 to the rails 40, 41 forming two areas of enclosure 52, 53, respectively (purpose later described). The back edge 55 of the "U" shaped bracket 50 extends outwardly of the rails 40, 41 so as to provide for small ear shaped flanges. These flanges cooperate with back brackets on the mower deck 70 so as to interconnect the mower deck 70 to the frame 20 for forward movement in respect thereto. The trailing edge 46 of the leading member 42 of the frame 20 provides a similar function in respect to the forward brackets on the mower deck 70. Reverse ear shaped flanges off the forward brackets or additional means (such as forward ears on the back brackets 72) could be utilized if desired, as could other means of interconnecting the deck brackets 72, 73 to the frame.

The mower deck 70 itself includes a deck section 71, two upwardly extending brackets 72, 73 and forward 74 and trailing 75 guide wheels. The deck 71 is a conventional mowing deck adapted for use with the invention primarily by the use of the brackets and the use of the guide wheels. This deck 71 can be single or multiple spindles. The particular mower deck shown is a 54" triple spindle mower deck having a leading central spindle. The spindles are rotatively connected to the engine so as to provide power to the mower blades of the deck. The deck 71 is mounted to the frame 20 of the lawn mower 10 via the two brackets 72, 73. These brackets 72, 73 are fixedly connected to the upper surface of the mower deck 71 such that the entire weight of the mower deck can be supported thereby. The particular brackets 72, 73 disclosed are generally "U" shaped brackets having sides extending generally beside and parallel so the sides of the rails 40, 41 of the frame. The distance between the sides of the brackets 72, 73 is approximately equal to the width of the rails 40, 41 (both inner and outer dimensions). Each side of the brackets 72, 73 extends upwardly immediately adjacent to the areas of enclosure 52, 53, respectively, of the "U" shaped brackets 50, 51 which are fixedly connected to the rails 40, 41. The brackets 72, 73 are tied together at their tops to increase their rigidity. Each bracket 72, 73 are tied together in a sideward direction by a bolt and spacer assembly 85 a distance upwards from the bottom thereof. This assembly increases the sideward rigidity of the brackets.

Each of the sides of the brackets 72, 73 are drilled with holes for the insertion of a quick disconnect pin or bolt. These holes 80 are preferably staggered in respect to each other such that a large range of precise height adjustment may be accommodated by the holes 80. The length of the pin 81 to its locking mechanism is a little more than the width of the brackets 72, 73. This strengthens the brackets 72, 73 against sideward forces by tying the sides of the brackets together. Upon the insertion of a pin 81 into the holes 80 through the respective area of enclosure, the brackets 72, 73 are selectively interconnected to the "U" shaped brackets 50, 51 of the frame 20 so as to allow movement upwards from a fixed lower cutting height position in respect thereto. The fixed lower cutting height position is determined by the physical contact between the pin 81 and the bottom surface of the respective bracket 50, 51. Depending on height of cut, the upper position is determined by contact between the spacer assembly 85 and the bottom of the brackets 50, 51 or pin 81 contact with bottom of rails 40, 41. With this design, the deck 71 can be moved upwards from the height set by such pin 81 to the extent of the complete space between the assembly 85 and the brackets 52, 53, respectively, before there is a solid upward interconnection between the deck 71 and the frame 20. This allows for floating between the deck 70 and the frame 20 to the extent of the height of the area of enclosure. Note that the pin 81 in the preferred embodiment disclosed is not utilized in connecting the deck 71 to the frame 20 for forward and reverse movement of the lawn mower 10. This separation of functions allows staggered holes 80 to be utilized, thus strengthening this interconnection by allowing the holes 80 to be more widely separated for the same accuracy of adjustment. Also, the pins 81 are not subjected to forward/aft forces, and thus can be made smaller and easier to use than otherwise possible. The pins 81 also do not have to restrain the deck 71 against belt tightening forces on the spindle drive, thus significantly easing adjustment of the pins 81. For example, electro-magnetic and other constant belt tension interconnects can be used without compromising height adjustment.

The guide anti-scalp wheels 74, 75 allow for scraping protection for lawn mower 10 disclosed. This is provided by the fact that the guide wheels have a flange 90, 91, respectively, which can be selectively bolted to the deck 71 at various positions in respect thereto. By selecting a particular hole from a range of holes 93, 94, respectively, the height of scraping protection for the lawn mower 10 can be selectively chosen fore and aft independently if desired. In this respect it is noted that the pin 81 is used to set mowing height by respective contact with the bottom of the "U" shaped brackets 50, 51 when the lawn mower 10 is on a level surface with its guide wheels 74, 75 preferably adjusted for this given mowing height. This allows the anti-scalping wheels 74, 75 to be the secondary determinant of the height of cutting of the lawn mower while providing for a full floating interconnection deck 70 to frame 20.

The mower deck 70 is interconnected to the frame 20 for forward and reverse movement therewith by the use of the flanges extending off of the back edge 55 of the rear bracket and the edge of the leading member 42 in respect to the front bracket 51. In the preferred embodiment disclosed, the edges 55 are reinforced by a bolt on eared wear plate 79. This wear plate lengthens the service life of the mower 10 while also strengthening the bracket interconnection against both rearward and sideward loads. The bracket 72, 73 from the mower deck 71 solidly interconnects upon significant forward or reverse movement between the mower deck 70 and the frame 20. This ties the mower deck 70 to the frame for forward and reverse movement in respect thereto.

Although this invention has been described in its preferred embodiment with a certain degree of particularity, it is to be understood that numerous changes can be made without deviating from the invention as hereinafter claimed.

What is claimed:

1. A free flotation mower deck for a walk behind mower, said walk behind mower including a frame

having an aft section and a forward section fixedly interconnected by rails,

a front axle, said front axle being connected to said forward section of said frame, said front axle having wheels to the ground so as to support the forward section of the frame,

forward and aft "U" shaped brackets, said "U" shaped brackets attached to said rails so as to create areas of enclosure,

deck brackets, said deck brackets extending upwards off of the mower deck, said deck brackets having holes therein respectively, pins selectively insertable through said holes and into said areas of enclosures so as to interconnect said deck brackets to said frame in a lost motion type interconnection,

and means other than said pins to interconnect said deck brackets to said frame or said "U" shaped brackets extending therefrom so as to prevent the aft movement of said deck brackets in respect thereto.

2. The improved full flotation mower deck of claim 1 characterized by the addition of forward and aft anti-scalping wheels, said forward and aft anti-scalping wheels being selectively interconnected to said deck so as to provide for anti-scalping protection for the mower.

3. The improved full flotation mower deck of claim 1 characterized by reinforcing flanges, and said reinforcing flanges reinforcing the interconnection between said rails and said aft section of said frame.

4. The improved full flotation mower deck of claim 1 characterized in that said front axle is a swing axle having a single center point, and said single center point being pivotally connected to said forward section of said frame, but not the mower deck, for lateral pivoting in respect to said forward section.

5. The improved full flotation mower deck of claim 1 characterized in that said means other than said pins to interconnect said deck brackets to said frame or said "U" shaped bracket extending therefrom include said back walls of the "U" shaped bracket, said back walls extending outwardly so as to provide flanges, and said flanges cooperating with the adjoining said deck brackets on the mower deck so as to interconnect the mower deck to the frame.

6. The improved full flotation mower deck of claim 5 characterized by the addition of an eared wear plate, and said eared wear plate being bolted to said back walls of the "U" shaped bracket to strengthen the interconnection to said deck brackets on the mower deck.

7. A free flotation mower deck for a walk behind mower, said walk behind mower including a frame having an aft section and a forward section fixedly interconnected by rails,

a swing axle, said swing axle being pivotally connected to said forward section of said frame for lateral pivoting in respect to said forward section, said swing axle having wheels to the ground so as to support the forward section of the frame,

forward and aft "U" shaped brackets, said "U" shaped brackets suspended below said rails so as to create areas of enclosure,

deck brackets, said deck brackets extending upwards off of the mower deck, said deck brackets having holes therein respectively, pins selectively insertable through said holes and into said areas of enclosures so as to interconnect said deck brackets to said frame in a lost motion type interconnection,

and means other than said pins to interconnect said deck brackets to said frame or said "U" shaped brackets extending therefrom so as to prevent the aft movement of said deck brackets in respect thereto.

8. The improved full flotation mower deck of claim 7 characterized by the addition of forward and aft anti-scalping wheels, said forward and aft anti-scalping wheels being selectively interconnected to said deck so as to provide anti-scalping protection for the mower.

9. The improved full flotation mower deck of claim 7 characterized by reinforcing flanges, and said reinforcing flanges reinforcing the interconnection between said rails and said aft section of said frame.

10. A free flotation mower deck for a walk behind mower, said walk behind mower including a frame having an aft section and a forward section fixedly interconnected by rails,

a swing axle, said swing axle being pivotally connected to said forward section of said frame for lateral pivoting in respect to said forward section, said swing axle having wheels to the ground so as to support the forward section of the frame,

forward and aft "U" shaped brackets, said "U" shaped brackets suspended below said rails so as to create areas of enclosure,

deck brackets, said deck brackets extending upwards off of the mower deck, said deck brackets having holes therein respectively, pins selectively insertable through said holes and into said areas of enclosures so as to interconnect said deck brackets to said frame in a lost motion type interconnection,

means to interconnect said deck brackets to said frame or said "U" shaped brackets extending therefrom so as to prevent the aft movement of said deck brackets in respect thereto,

and means to interconnect said deck brackets to said forward section so as to prevent the forward movement of said deck brackets in respect thereto.

* * * * *

US005412932A

United States Patent [19]

Schueler

[11] Patent Number: 5,412,932

[45] Date of Patent: May 9, 1995

[54] MOTOR-POWERED LAWN MOWER

[75] Inventor: Robert A. Schueler, Franklin, Wis.

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[52] U.S. Cl. 56/249; 56/7

[58] Field of Search 56/6, 7, 249, 294

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Primary Examiner—Michael Powell Buiz
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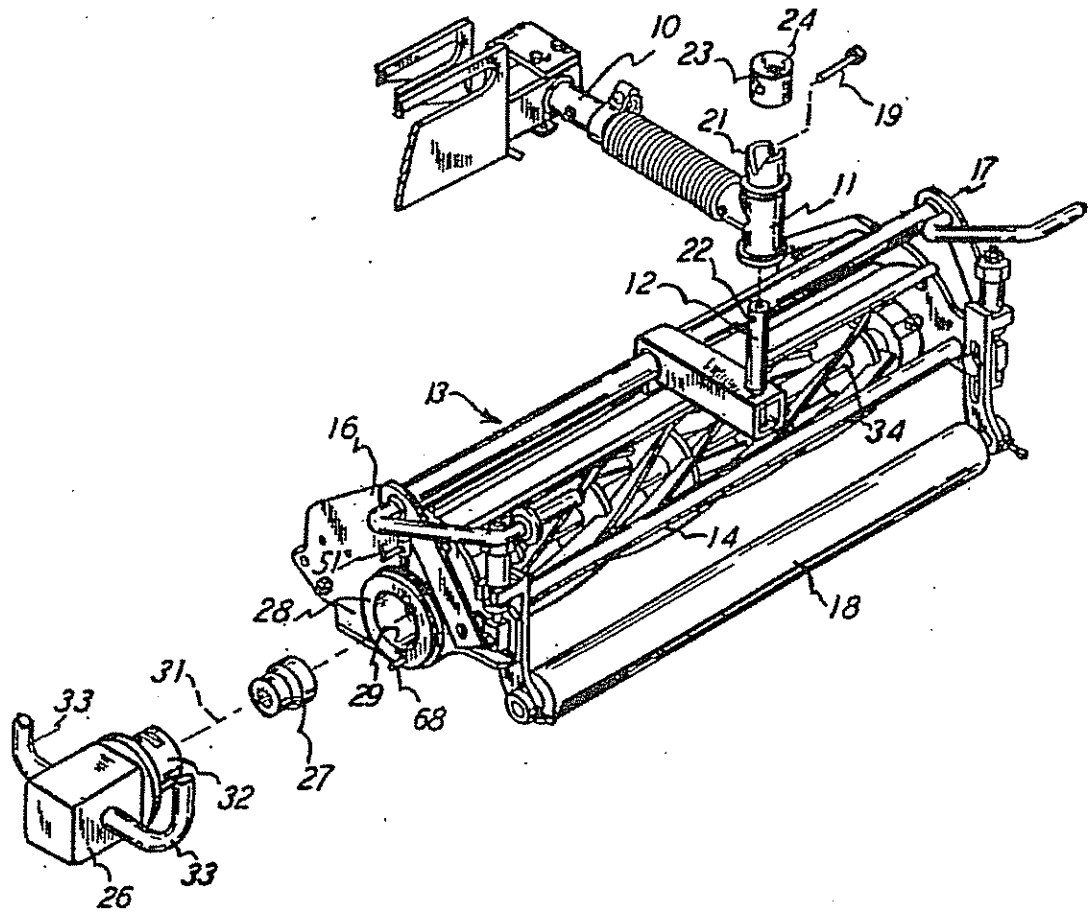
[57] ABSTRACT

A motor-powered lawn mower having a quick connect and disconnect pin interposed between the motor and the mower. A motor support member with a grease cavity is provided for receiving the motor, and the motor and the mower reel shaft are on the same axis. The grease cavity has an air vent which is incorporated in the quick release pin.

21 Claims, 3 Drawing Sheets



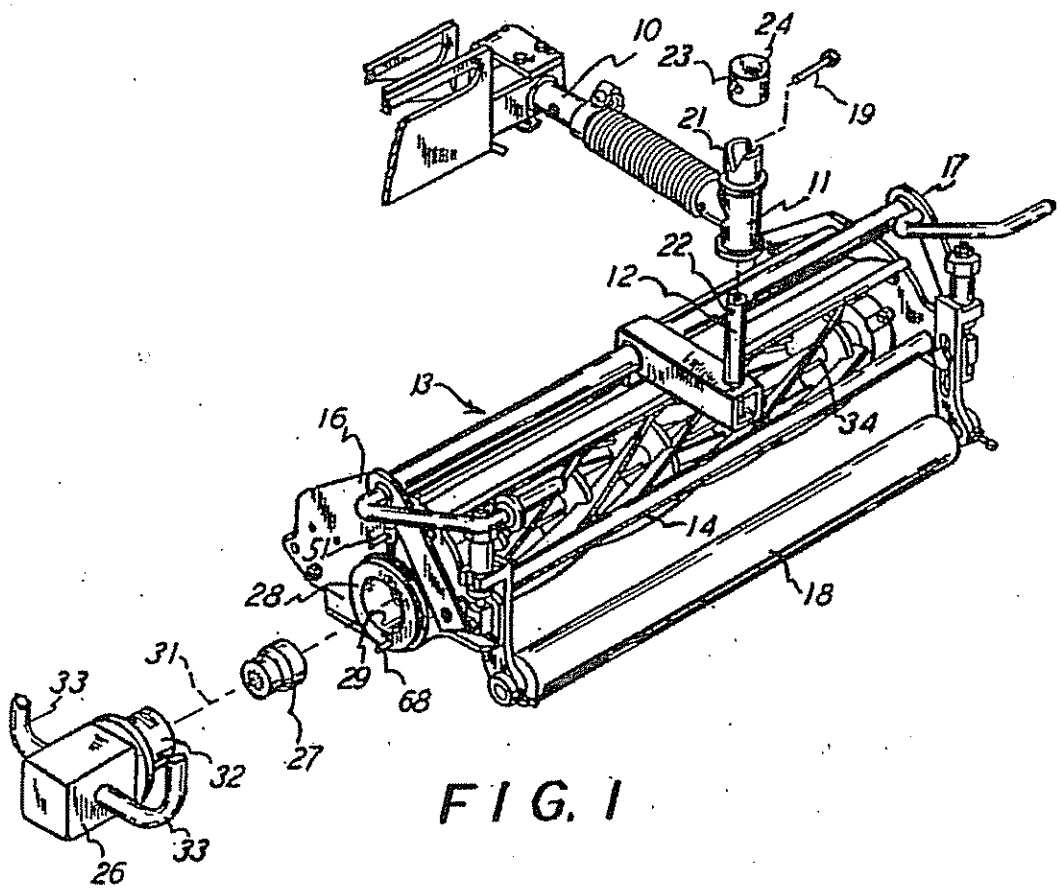


FIG. 1

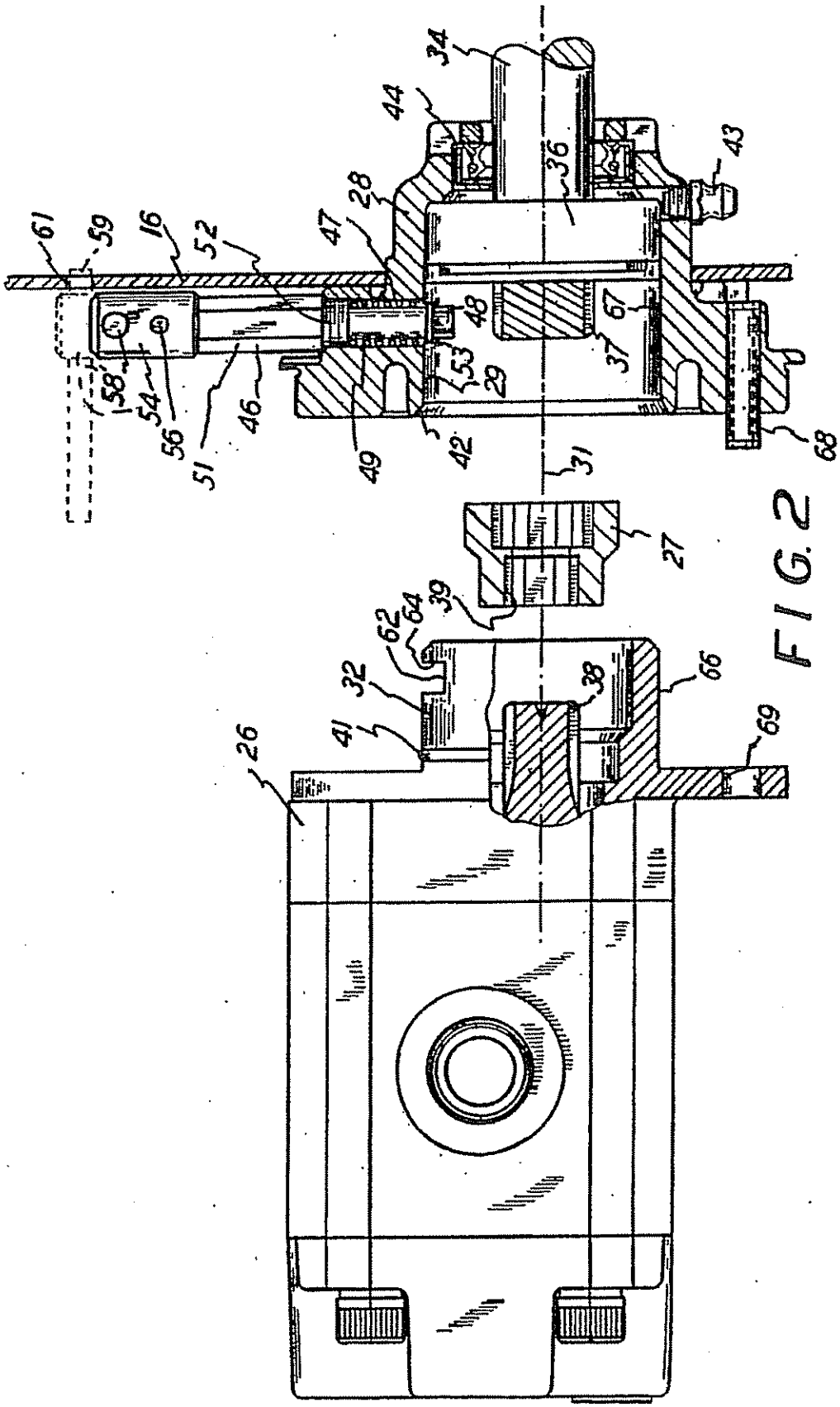

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FIG. 2

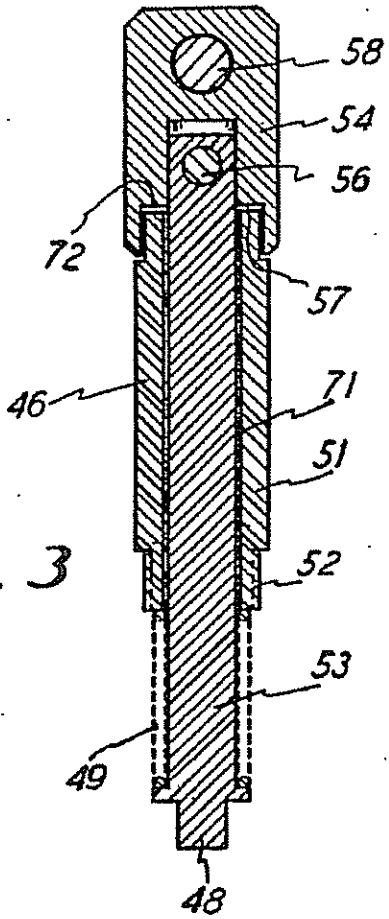

FIG. 3

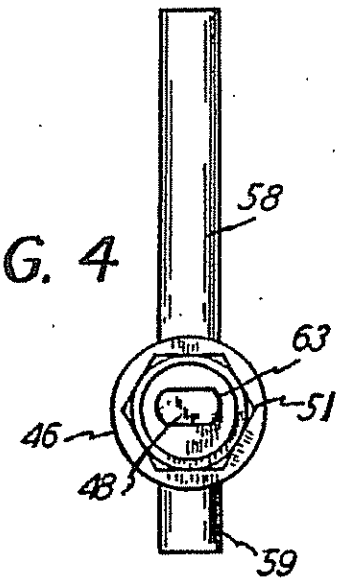

FIG. 4

MOTOR-POWERED LAWN MOWER

A motor-powered lawn mower which is arranged for quick connect and disconnect of the reel relative to the powering motor and the remainder of the machine.

BACKGROUND OF THE INVENTION

The invention is particularly applicable to gang mowers where three or more reel-type mowers are mobily supported by a tractor or the like. The mowers of this invention are particularly suitable for extremely precise mowing, such as for a golf course green or putting surface. Those types of lawn mowers are reel mowers which are arranged to produce mowing and which catch the grass clippings in the mowing process. Examples of this type of lawn mower are shown in U.S. Pat. Nos. 3,429,110 and 3,511,033 and 3,905,180. That is, there is a reel-type gang mower which has the mowers supported on a tractor, and these mowers are powered by a hydraulic motor which has hydraulic lines connected from the tractor to the motor which is directly attached to the individual mowers.

The concern in this art is to be able to quickly detach and remove the mower from the rest of the machine so that the mower can be adjusted, sharpened, or otherwise serviced or replaced, as necessary. However, the present invention does not require the use of any bolting or other attachment of the hydraulic motor to the mower and thus does not require that there be special wrenches or other tools for removing the reel or mower itself from the remainder of the machine, and such removal requires separating the hydraulic motor and its hydraulic lines from the mower itself.

The present invention provides an arrangement for quickly detaching the mower itself from the remainder of the machine, but to do so without requiring special tools or skills by which the mower is isolated from the remainder of the machine for the purposes mentioned. That is, the present invention provides for a quick disconnect, and likewise a quick connect, of the mower from the hydraulic system and the remainder of the machine. Also, the mower can be quickly disconnected from the support arm or the like of the tractor, and thus the mower unit is fully removed from the tractor in a quick and simplified procedure.

In accomplishing the aforementioned, it is also significant that the mower arrangement in this invention is an in-line arrangement of the mower reel axis relative to the driving motor axis, so that the two are in line and in compact relationship for ease of connecting and disconnecting and for simplification of overall structure and reliability of the driving function.

Still further, the connection between the mower and the motor is such to provide a cavity therebetween which can receive a lubrication, such as grease, so that the mower reel shaft can be supported in a greased bearing. Still further, the mounting arrangement mentioned is such that the grease cavity is vented for optimum condition of the greasing procedure. In accomplishing this objective, the quick connect arrangement is such that the grease cavity is sealed by means of the quick connection, and thus the connection and the sealing are achieved in the same single arrangement of the mechanism.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is an exploded perspective view of a fragment of a mowing maching showing this invention.

FIG. 2 is a front elevational and partly sectional and enlarged exploded view of parts shown in FIG. 1.

FIG. 3 is a vertical sectional view of a portion of FIGS. 1 and 2.

FIG. 4 is a bottom plan view of FIG. 3.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

FIG. 1 shows a portion of a mowing machine which is tractor mobilized and includes a forwardly extending tractor lift and push arm 10 which presents a vertical sleeve 11 for receiving a vertical post 12 on a reel-type mower designated 13. Thus, the tractor is arranged to mobilize the entire machine and to advance the mower 13 over the ground and to mow the grass by means of the rotating reel 14 which is rotatably supported in spaced apart side frames 16 and 17. A ground-engaging roller 18 is disposed in advance of the reel 14. The aforementioned is of a standard type mowing machine which includes the tractor and the mower, as mentioned, and it of course is of the nature disclosed fully in the aforementioned U.S. patents.

The mower 13 is connected to the tractor through the upstanding post 12 which is received in the sleeve 11 and which is retained therein by means of a pin 19 which extends in the upper V-shaped slot 21 and into the pin hole 22 in the upstanding post 12. Thus the mower 13 is releasably secured to the tractor, such as to the push arm 10, by means of the releasable pin 19 and this is a quick connect and disconnect attachment of the mower 13 relative to the tractor. The pin 19 also extends through a pin hole 23 in a cap 24 which fits over the upper end of the sleeve 21 in the assembled position, and of course it is understood that the heretofore described portion of the machine is in the exploded view format and the dot-dash line extending from the pin 19 to the slot 21 and down to the upstanding post 12 shows the line of assembly, in the conventional exploded view display which will be readily understood by one skilled in the art.

Likewise, FIG. 1 shows the exploded display of a motor 26 which is in driving relation with the reel 14 by means of a gear coupling 27, and again the dot-dash lines extending along the longitudinal axis of the parts mentioned indicate the assembly and positioning of the motor 26 onto the side frame 16 of the reel 13.

The mower side frame 16 receives and supports a bearing housing 28 which is generally annular in shape, as shown, and any suitable means of fixing the housing 28 with the side frame 16 is employed. The bearing housing 28 has a cylindrical cavity 29 extending on the exploded view axis 31, and that is the longitudinal axis of the parts being described. The gear coupler 27 nests within the cavity 29, and the motor 26 has a cylindrical extension 32 which is snugly received in the cylindrical cavity 29 such that the motor 26 is in cantilever support and relationship on the mower 13 in the assembled position. As such, motor 26 is in rotation driving relationship to the reel 14 and it is in sturdy and stable position relative to the mower 13.

In the preferred embodiment, the motor 26 is a hydraulic motor having hydraulic lines 33 connected with the motor 26, and of course the lines 33 extend in an unshown connection with the unshown tractor, but the

connection could of course be such as that well known in the art or as shown in the aforementioned U.S. patents. Accordingly, the entire hydraulic drive to the mower 13 is attached to the mower in a manner more fully described hereinafter, and it is the quick connect and disconnect type of attachment of the driving motor 26 in line or on the axis of the reel 14 and that is the feature of this invention.

FIG. 2 therefore shows the reel shaft 34 which is rotatably supported in the bearing housing 28 by means of a rotation bearing 36. The end of the shaft 34 has gears 37 which are engaged by the coupler 27 when the latter is disposed within the housing cavity 29, as mentioned. Similarly, the motor 26 has a shaft 38 with teeth thereon and is received within the coupler opening 39 to be in driving relation with the coupler 27. That is, the motor 26 has its extension 32 snugly disposed within the cylindrical cavity 29, and the intervening coupler 27 provides the drive connection between the motor shaft 38 and the mower shaft 34.

In the assembled position, an O-ring 41 extends endlessly around the motor cylindrical extension 32 and is disposed in contact with a chamfered recess 42 in the bearing housing 28. When assembled, the bearing cavity 29 is enclosed, except for a vent which will be described hereinafter. As such, the cavity 29 will retain grease, which can be supplied by means of the grease fitting 43 extending into the portion of the cavity 29 adjacent the bearing 36. A grease seal 44 is interposed between the housing 28 and the shaft 34, as shown.

A quick connect and disconnect fastener is utilized for releasably retaining the motor 26 on the combined mower frame 16 and bearing housing 28. That is, a pin 46 extends through an opening 47 in the housing 28 and the pin lower end 48 extends into the cavity 29 and that is achieved by means of a compression spring 49 which urges the pin 46 downwardly to the position shown in FIG. 2. In detail, the pin 46 has a sleeve 51 which is threaded into the bearing housing opening 47 by the threaded sleeve end 52. Thus the sleeve 51 is in fixed position relative to the bearing housing 28. FIG. 3 shows that the pin 46 also includes a center pintle 53 which is movable along the up-and-down longitudinal axis of the pin 51 to where the pin 53 can move to the downward position shown in FIG. 2 and that position is established by the pin cap 54 being attached to the pintle 53 by the cross pin 56,and the cap 54 therefore rests downwardly on the sleeve 51, such as at the shouldered portion 57. As such, the spring 49 urges the inner pin 53 downwardly into the cavity 29 and to the limit of the cap 54 engaging the sleeve 51.

When it is desired to retract the pin end 48 from the cavity 29, the pintle 53 is urged upwardly against the spring 49, such as by raising the cap 54 through a lift arm 58 pinned into the cap 54, and that raised position can be the dotted position shown in FIG. 2 which will therefore have moved the pin lower end 48 upwardly and out of the cavity 29. In that released or raised position, the pin arm 58 has an end 59 which projects into an opening 61 in the mower frame 16, and thus the pin 51 is held in the retracted position when the cap 54 is raised and rotated approximately 90 degrees from the full line position shown in FIG. 2 to the dotted position shown in FIG. 2 and that is when the arm end 59 is positioned within the retaining opening 61.

The pin lower end 48 secures the motor 26 in the bearing housing 28 by means of projecting into an upwardly facing groove 62 in the motor extension 32. Of course that is when the pin 53 is released and downward, such as in the position shown in FIG. 2. Further, the pin end 48 has a camming surface 63 which presses against the wall 64 of the groove 62 for forcing the motor extension 32 into the cavity 29 such that the motor 26 is securely held on the bearing housing 28. Also, in that camming action, the O-ring 41 is forced against the chamfer 42 for the grease seal therebetween.

That is, the pin end 48 is retracted from the cavity 29 and the motor extension 32 is disposed in the cavity 29 and its cylindrical wall 66 is in snug sliding contact with the inner cylindrical wall 67 of the cavity 29. The pin 53 is then released, such as by moving the arm end 59 out of the frame hole 61 to allow the spring 49 to project the pin cam end 48 into the slot 62. Subsequently, upon rotation of the pin 53 its cam surface 63 bears against the groove wall 64 for the tightening action described.

To avoid rotation of the motor 26 relative to the housing 28, a pin 68 projects on the housing 28 and is received in an opening 69 on the motor 26. Of course the motor 26 and the reel shaft 34 are in line or co-axial, and the pin 68 is eccentric, and thus the quick connect and disconnect is in the co-axial arrangement and there will be no rotation of the motor 26 relative to the housing 28 because of the eccentric pin 68.

The pin 51 also serves as a fluid vent for the cavity 29 and the vent is established through the opening 47 and there is an annular space 71 between the sleeve 51 and the pin 53, as seen in FIG. 3, and there is also the opening at 72 between the cap 54 and the sleeve 51 and that opening 72 vents to the atmosphere.

In the arrangement mentioned, the action of pin 46, particularly the camming action described, provides the dual function of sealing with the O-ring 41 and securely holding the motor 26 on the bearing housing 28. All is achieved by a simple and readily achieved 90 degree rotation of the pin 51 which does not require any special tools or skills for the connect and disconnect. Further, the pin 51 can be held in the disconnect position by means of the pin end 59 being disposed in the frame opening 61. In that arrangement, the motor 26 is separated from the reel 13 and the hydraulic line 33 can remain attached with the motor 26 and need not be disconnected for any reason, but the reel is disconnected by means of release pin 51 and by the tractor attaching pin 19, all in the simplified manner described. In this arrangement, the mower frame 16 and the bearing housing 28 are described as a support for the motor 26 which can be quickly connected and disconnected from that support.

In the FIG. 2 position, the cam 63 is in the engaged mode. Thus the actuator arm 58 is shown parallel to the frame 16, and the arm 58 will be in that engaged mode because the frame 16 prevents the arm end 59 from rotating out of that cam-engaged mode. Only when the pintle 53 is raised against the downward force from spring 49 can the arm 58 be rotated to the disengaged mode shown by the dotted lines in FIG. 2, and that is when arm end 59 can enter the frame hole 61. So by observing the orientation of the arm 58, the user can see in which mode the fastener 51 is disposed.

Also, pin 68 and hole 69 serve to orient the motor 26 on the housing 28, and thus the groove 62 is properly positioned to receive the pintle 53.

What is claimed is:

1. A motor-powered lawn mower comprising a mower frame, a rotation-bearing housing mounted on said frame and having a cylindrical cavity with a longi-

tudinal axis, a rotation bearing disposed in said housing and having a rotation axis co-axial with said longitudinal axis, a lawn mower reel having a reel shaft with a longitudinal axis and being rotationally supported on said bearing with said respective axes aligned for rotatably supporting said reel, a motor having a cylindrical extension therein snugly releasably telescoped in said cylindrical cavity to have said motor cantilever supported on said housing and have its cylindrical axis axially aligned with said reel shaft axis for the rotation of said reel, and a releasable fastener releasably connected between said housing and said motor and being operatively movable in a direction transverse to the telescoping axes of said housing and said motor for selectively engaging and disengaging said motor to releasably hold said motor in said cavity.

2. The motor-powered lawn mower as claimed in claim 1, including a lubrication sealer disposed intermediate said housing and said motor for sealing said cavity.

3. The motor-powered lawn mower as claimed in claim 2, wherein said fastener has an air vent in fluid-flow communication with said cavity for venting said cavity.

4. The motor-powered lawn mower as claimed in claim 2, wherein said lubrication sealer is an O-ring disposed contiguous to said cavity and surrounds said cylindrical extension for sealing compression in the direction parallel to said telescoping axes of said housing and said motor.

5. The motor-powered lawn mower as claimed in claim 1, including a connector engaged with both said housing and said motor for restricting relative rotation of said motor on said housing.

6. The motor-powered lawn motor as claimed in claim 1, wherein said releasable fastener is rotatable about said transverse direction and includes a cam arranged for effective camming action between said housing and said motor upon rotation of said fastener for forcing said motor cylindrical extension into said cavity.

7. The motor-powered lawn motor as claimed in claim 6, including a connector engaged with both said housing and said motor for restricting relative rotation of said motor on said housing.

8. The motor-powered lawn motor as claimed in claim 7, wherein said releasable fastener is movably mounted on said housing, and said cam projects into said cavity for releasable engagement of said cylindrical extension.

9. The motor-powered lawn mower as claimed in claim 8, wherein said cylindrical extension has a groove therein for receiving said cam in said camming action.

10. The motor-powered lawn mower as claimed in claim 7, including a lubrication sealer disposed intermediate said housing and said motor and being arranged to be compressed into sealing operation in the direction parallel to said axis, and said cam being arranged to force onto said motor in said direction parallel to said axis for the compressing of said sealer.

11. The motor-powered lawn mower as claimed in claim 1, including a spring operative on said fastener for releasably holding said fastener in engagement with said motor.

12. The motor-powered lawn mower as claimed in claim 11, including means interengageable between said fastener and said housing for releasably holding said fastener out of engagement with said motor for the removal of said motor from said housing.

13. The motor-powered lawn mower as claimed in claim 11, wherein said fastener includes a cam arranged for camming action between said housing and said motor upon rotation of said fastener for forcing said motor cylindrical extension into said cavity.

14. The motor-powered lawn mower as claimed in claim 13, including a connector engaged with both said housing and said motor for restricting relative rotation of said motor on said housing.

15. The motor-powered lawn mower as claimed in claim 1, including a tractor for mobily supporting said mower frame, an arm on said tractor, and a releasable connection between said arm and said mower frame and being adapted for quick release for the removal of said mower frame from said tractor.

16. A hydraulically powered lawn mower, comprising a mowing reel having a shaft presenting a rotation axis, a rotation support engaged with said shaft for rotatably supporting said reel on said axis, a hydraulic motor mounted on said support for driving said reel and having a rotation axis co-axial with said shaft axis, a releasable fastener interconnected between said support and said motor and being operable in a direction transverse to said axes for quick connect and disconnect of said motor relative to said support, and a rotation arrestor interconnected between said motor and said support for precluding rotation of said motor about said support.

17. The hydraulically powered lawn mower as claimed in claim 16, including a spring operatively associated with said fastener for releasably urging said fastener into the position of releasably securing said motor on said support.

18. The hydraulically powered lawn mower as claimed in claim 16, wherein said support and said motor are telescopically connected together, and said fastener is mounted on said support and includes a cam engaged with said motor for camming said motor into telescoped position on said support.

19. The hydraulically powered lawn mower as claimed in claim 18, wherein said support has a cavity on said axis, a rotation bearing in said cavity for rotation support of said reel, a lubrication sealer interposed between said support and said motor and surrounding said cavity for sealing said cavity upon the camming action on said motor, and a grease fitting on said support in grease-flow communication with said cavity for greasing said bearing.

20. The hydraulically powered lawn mower as claimed in claim 16, including an arm on said fastener for rotating said fastener between the connect and disconnect positions, said arm extending toward said support and being in abutment interference with said support in the connect position, and said support has an opening for receiving said arm to avoid said interference when said fastener is moved transversely and into said opening in the disconnect position.

21. The hydraulically powered lawn mower as claimed in claim 16, whwerin said support and said mower are telescoped together, said fastener and said motor respectively include a cam and a cam surface, and orientation means operatively connected between said support and said motor for orientation of said cam and said cam surface in the telescoped togetherness.

* * * * *

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United States Patent [19]

Smith

[11] Patent Number: 5,423,565

[45] Date of Patent: Jun. 13, 1995

[54] MOWER HITCH FOR LAWN TRACTOR

[76] Inventor: Frederick Smith, 458 Random Rd., Ripley, W. Va. 25271

[21] Appl. No.: 257,671

[22] Filed: Jun. 8, 1994

[51] Int. Cl.[6] B60D 1/14

[52] U.S. Cl. 280/411.1; 280/492; 56/6; 56/15.9; 172/313; 172/624

[58] Field of Search 280/411.1, 412, 413, 280/456.1, 457, 492, 493, 494, 504; 56/6, 14.9, 15.7, 15.8, 15.9; 172/310, 313, 459, 624, 677

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Primary Examiner—Eric D. Culbreth
Assistant Examiner—Victor E. Johnson

[57] ABSTRACT

A hitch attaches to a lawn tractor and draws two lawn mowers therebehind. The hitch includes a draw bar solidly mounted to the tractor, and a link for each towed mower, which mowers each include a bracket to the deck thereof. The links include plumbing tees perpendicularly arranged, so that universal joints are formed between the draw bar and the mowers. A third tee is provided at each bracket so that each mower may be individually tilted, as for enabling access to the underside while still ganged to the hitch. The draw bar, links, and third tee are made from readily available plumbing components. The resultant hitch is thus fabricated from readily available components, is durable, uncomplicated, and has wide flexibility in allowing for various attitudes of the mowers. This enables individual mowers to follow the contour of uneven terrain, turn in tight quarters while being towed, and to be temporarily tilted for access to the cutting blade and oil drain cock without requiring disassembly from the hitch.

7 Claims, 2 Drawing Sheets

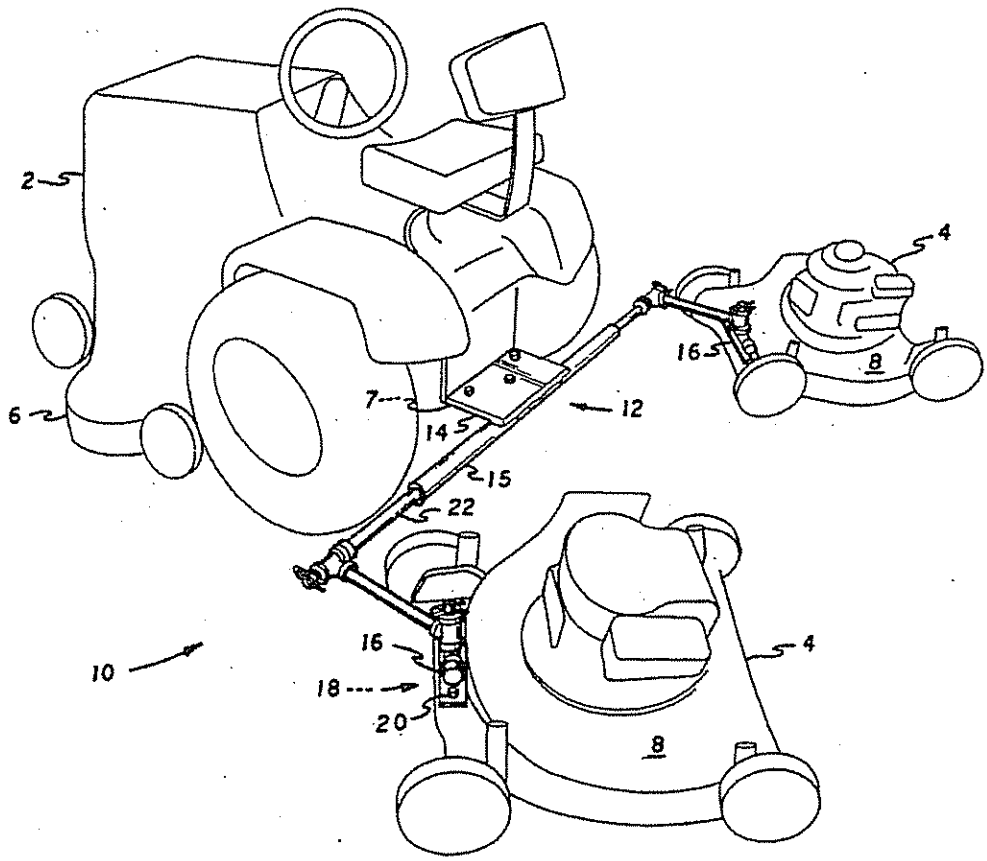
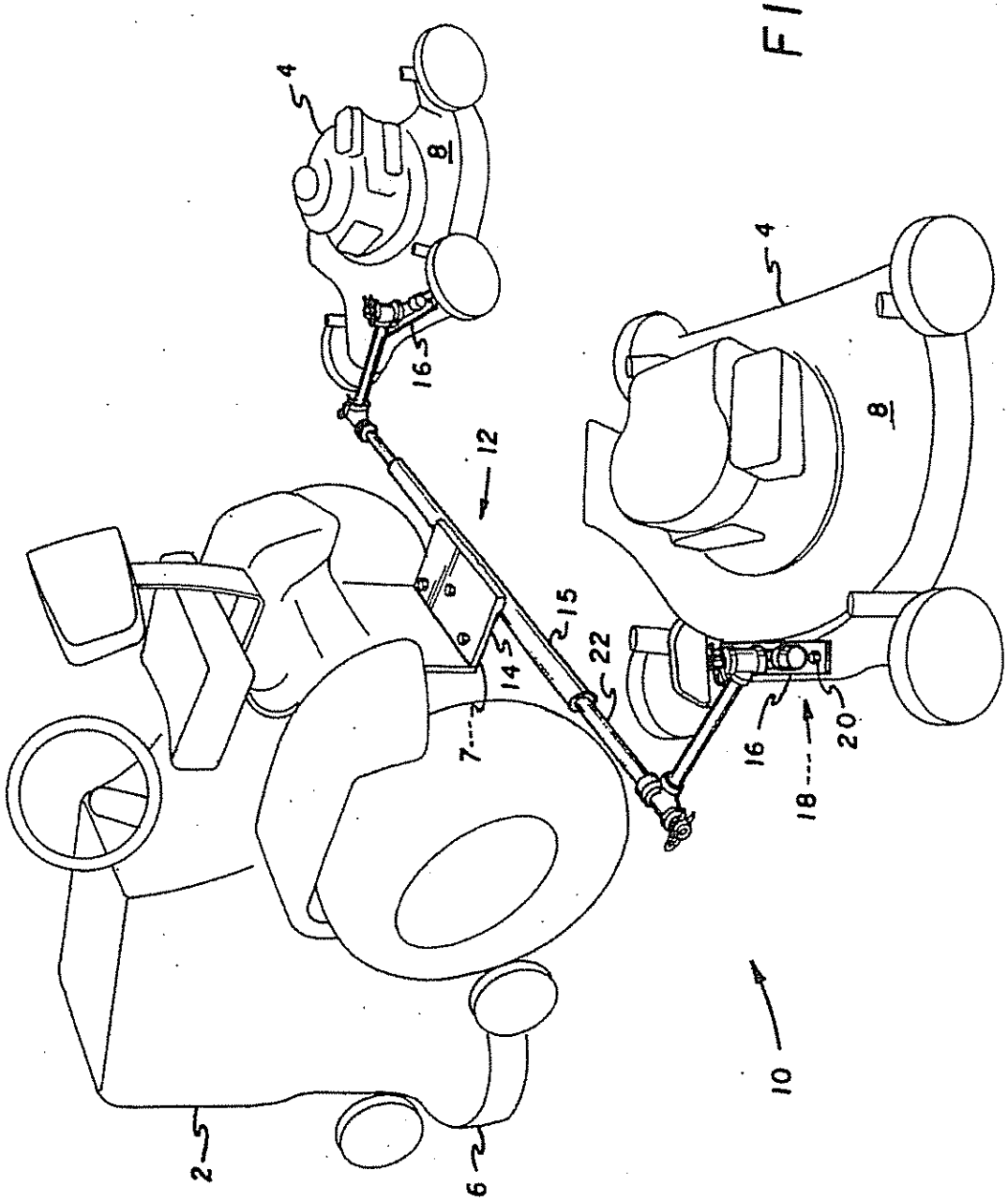


FIG. 1



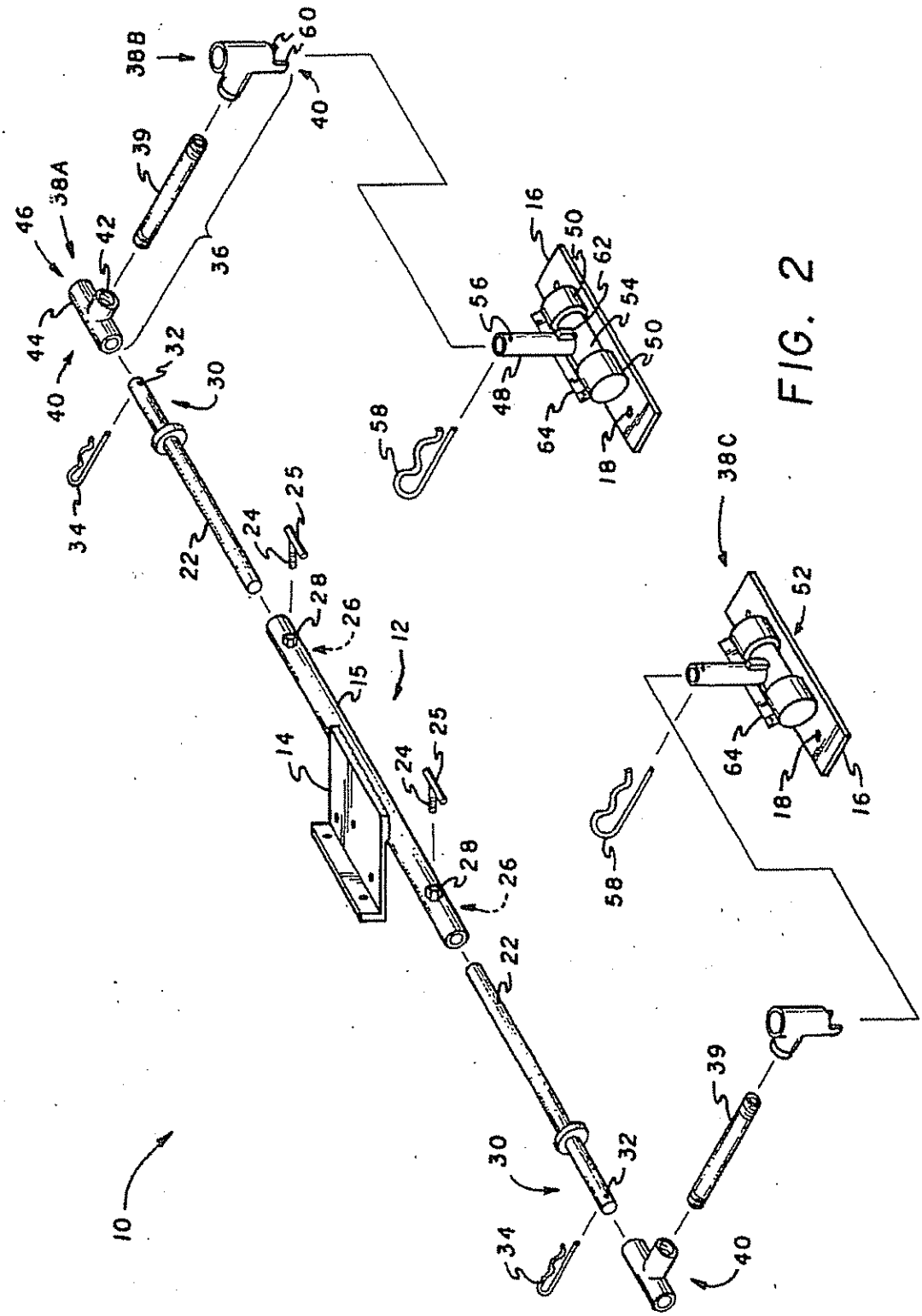

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FIG. 2